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A Bibliography. Volume 1
Selected Metals

Oak Ridge National Lab, TN

Prepared for

Municipal Environmental Research Lab, Cincinnati, OH

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Municipal Environmental Research
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Cincinnati OH 45268

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Movement of Hazardous Substances in Soil: A Bibliography

Volume 1
Selected Metals

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16. ABSTRACT

This bibliography is intended for use by personnel concerned, either via research or management, with the disposal of hazardous wastes, other than sewage sludge, on land. It is the result of a search of recent literature (1970 through 1974) and includes information on the transport, transformation, and soil retention of arsenic, asbestos, beryllium cadmium, chromium, copper, cyanide, lead, mercury, selenium, zinc, halogenated hydrocarbons, pesticides, and other hazardous substances. About half of the 2000 entries include an abstract. To limit the size of the resulting publication, the literature search focused on processes directly related to transport (adsorption, ion exchange, etc.) and documentation of the occurrence and extent of transport while specifically excluding topics such as uptake and translocation by plants, theoretical modeling, and effects on microorganisms and processes mediated by microorganisms. The bibliography has been divided into two volumes to facilitate its use. Volume 1 contains all the hazardous substances studied except pesticides; Volume 2 contains the pesticide citations.

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MOVEMENT OF HAZARDOUS SUBSTANCES IN SOIL: A BIBLIOGRAPHY

Volume 1. Selected Metals

by
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Interagency Agreement EPA-IAG-D4-F476

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FOREWORD

The Environmental Protection Agency was created because of increasing public and government concern about the dangers of pollution to the health and welfare of the American people. Noxious air, foul water, and spoiled land are tragic testimony to the deterioration of our natureal environment. The complexity of that environment and the interplay between its components require a concentrated and integrated attack on the problem.

Research and development is that necessary first step in problem solution and it involves defining the problem, measuring its impact, and searching for solutions. The Municipal Environmental Research Laboratory develops new and improved technology and systems for the prevention, treatment, and management of wastewater and solid and hazardous waste pollutant discharges from municipal and community sources, for the preservation and treatment of public drinking water supplies, and to minimize the adverse economic, social, health, and aesthetic effects of pollution. This publication is one of the products of that research; a most vital communications link between the researcher and the user community.

The Solid and Hazardous Waste Research Division contributes to these program objectives by conducting research to promote improved solid waste management. This report presents the results of a search of recent literature on transport, transformation, and retention in soil of selected hazardous substances.

Francis T. Mayo, Director
Municipal Environmental Research
Laboratory

ABSTRACT

This bibliography was prepared by the Toxic Materials Information Center (TMIC), Oak Ridge National Laboratory, for the Solid and Hazardous Waste Research Division, EPA Municipal Environmental Research Laboratory, Cincinnati, Ohio. The bibliography is intended for use by personnel concerned, either via research or management, with the disposal of hazardous wastes, other than sewage sludge, on land. It is the result of a search of recent literature (1970 through 1974) and includes information on the transport, transformation, and soil retention of arsenic, asbestos, beryllium, cadmium, chromium, copper, cyanide, lead, mercury, selenium, zinc, halogenated hydrocarbons, pesticides, and other hazardous substances. About half of the 2000 entries include an abstract. In order to limit the size of the resulting publication, the literature search focused on processes directly related to transport (adsorption, ion exchange, etc.) and documentation of the occurrence and extent of transport while specifically excluding topics such as uptake and translocation by plants, modeling, and effects on microorganisms and processes mediated by microorganisms. The bibliography has been divided into two volumes to facilitate its use; the pesticides citations have been placed in a separate volume.

In addition to the TMIC's own data files, the following sources were searched: Soils and Fertilizers Abstracts (1972 - 1974 plus bibliographies covering older material); Pollution Abstracts (1970 - 1974); Environment Abstracts, formerly Environment Access (December, 1970 - 1974); Chemical Abstracts and BioResearch Index (1970 - 1974); Nuclear Science Abstracts (1972 - 1974); U.S. Government Reports (1973 - 1974); Health Effects of Environmental Pollutants (1972 - 1974); Health Aspects of Pesticides Abstract Bulletin, now Pesticides Abstracts (1972 - 1974); and Industrial Wastes Information Bulletin (1973 - 1974). These sources, combined with other pertinent books, symposia, etc., should make this two-volume document representative of current information on movement of hazardous substances in soil. Format for all citations in this document is not uniform; this is due, in part, to the merging of data bases without retyping citations. Each citation is complete, though the order of presentation may differ. This report was submitted in fulfillment of Interagency Agreement No. D4-F476 by Oak Ridge National Laboratories under the sponsorship of the U.S. Environmental Protection Agency. This report covers the period of April 25, 1974 to September 30, 1974.

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SECTION I
ABSTRACTS

1

An Interdisciplinary Study of Transport and Biological Effects of Molybdenum in the Environment

Interim Progress Report, June-Dec. 1971; PB-222 616; Monitoring Agency Rept No. NSF-RA/E-72-005;Grant NSF-GI-30014; Dec 71, 133 P.; 1971, December

MOLYBDENUM; ENVIRONMENTAL SURVEYS; AIR; WATER; MINING; TRACE ELEMENTS; GEOCHEMISTRY; WATER CHEMISTRY; STRESS PHYSIOLOGY; FOCD CONTAMINATION; SOIL ANALYSIS; ANIMALS; MOLYBDENUM MINING; BIOLOGICAL EFFECTS; MOVEMENT; TRANSPORT

The purpose of the research effort is to examine the release and transport of molybdenum and its subsequent impact on man and his environment. This study has particular relevance to Denver and the surrounding mountainous and agricultural areas which are target areas for abnormally high levels of molybdenum in streams draining the mountainous area to the west of Denver. The study consists of an interdisciplinary effort which involves: (1) determining the sources of the molybdenum in surface waters, (2) determining the rates and modes of transport, (3) determining the targets, (4) determining the biological cycling, (5) developing analytical tools, (6) examining the biological effects particularly with regard to calcium transport and energy transduction, (7) examining the potential economic ramifications of the study, (8) studying various aspects of the public perception of who the public holds responsible and how willing the public is to participate in the solution of a possibly hazardous situation.

2

Accumulation of Chromium 51 by the Beach Diatom, CHAETOCEROS ARMATUM

; Washington University, Labcratcry of Radiation Ecology, Seattle, Washington

RLO-2047-5, App. G, 2 p.; 1969

ABSORPTION; AGE ESTIMATION; QUARTZ; SOILS; CHROMIUM 51; DIATOMITE; FOSSILS

To a culture of about 60 ml of CHAETOCEROS ARAMATUM containing no, or very little, particulate matter, one microcurie of Cr 51 was added. The culture was incubated at 18 degrees centigrade and samples taken at three, six, and twelve days. Results indicate that at least 90 percent of the Cr 51 is taken up in ionic form.

3

Permissible Levels of Toxic Metals in Sewage Used on Agricultural Land

; Ministry of Agriculture, Fisheries and Food, Tolcarne Drive, Pinner, Middlesex HA5 2DT, England

Agricultural Development Advisory Service, Advisory Paper No. 10, 12 p.; 1971, July

HEAVY METALS; SEWAGE; AGRICULTURE; NITROGEN; PHOSPHORUS; ZINC; COPPER; NICKEL; SLUDES; BORON; ADDITIVITY; CHROMIUM; CHORMATE; PH; CROPS; ZINC EQUIVALENT: AVAILABILITY; LIMING; MANURE; ORGANIC MATTER; CEREALS; POTATOES; SENSITIVE SPECIES; COBALT; CADMIUM; LEAD; MERCURY; VEGETABLES; ANALYTICAL METHODS; ACTIVATED SLUDGES

Report deals with setting permissible levels for toxic metals in sewage or sludges applied to agricultural land. They assume chromium in cationic form is not toxic (below 500 ppm in the soil), and that chromates and dichromates do not occur since they would be reduced by the organic matter in the sewage. Thus, they worry chiefly about copper, nickel and zinc and calculate a 'zinc equivalent'assuming (1) that copper is twice as toxic as zinc and nickel 8 times as toxic as zinc and (2) that the effects are additive. From various experiments they conclude it is possible to add zinc to the soil up to 250 ppm over a long period, say 30 years, and (since there are 2 million pounds of top soil per acre) this can be expressed as 500 pounds of zinc per acre or 17 pounds/acre/year. For a given analysis of the sludge the amount of dry sludge which can be added per year (or less frequently) can be calculated. There are some qualifications if sludge has been applied previously, but if it was applied more than three years ago, it is likely any remaining metals in the soil are unavailable. Analytical methods for determining available metals are given. The extraction procedure is critical. Where too much of the toxic metals mentioned above have been applied, the effects can be reduced by liming and also by adding manure or peat. In some soils (sandy soils) it may be necessary to lime frequently. Boron in excess is toxic to some crops (potatoes, vegetables, cereals) and should not be added in the sludge at more than 4 pounds/acre (3 pounds/acre if sludge used the previous year); it is leached out of the soil rapidly. Other toxic metals (cobalt, cadmium, lead, mercury) may occur occasionally in sewage. Even on grass (which is the least sensitive crop) to which sewage has been applied, it is advisable to wait till the sewage has been washed off the grass by rain before pasturing to avoid possible toxic hazards to livestock. It should also be noted that any toxicity problem that is allowed to develope will last for several years.

4

Zinc in Soil

; Commonwealth Bureau of Soils, Harpenden, England

Bibliography No. 1532, 23 p.; 1972, April

SOILS; MOISTURE; PLANTS; AVAILABILITY; PLANT NUTRITION; DEFICIENCY; TRACE ELEMENTS; ZINC; COPPER; LEAD; CADMIUM; UPTAKE; SPECIES DIFFERENCES; CONCENTRATION; MANGANESE; ORGANIC MATTER; PHOSPHORUS; BIOGEOCHEMISTRY; PH; LIMING; FERTILIZERS; CROP YIELDS; MAGNESIUM; TEA; SEWAGE SLUDGE; CORN; MOSSES; AIRBORNE DUSTS; DUSTS; CRITICAL SOIL VALUE; ECONOMIC RESPONSE; HUMUS; MIGRATION; ADSORPTION; CHELATES; BIOASSAY; COLORIMETRY; FOUNDRY SMOKE; RICE; PROSPECTING; CALCAREOUS SOILS

Brief results of 85 papers. Important items are keyworded.

5

Environmental Pollution by Lead and Other Metals

; Illinois Univ., Urbana. Environmental Studies Program

Progress Report May 1, 1971 - April 30, 1972; Monitoring Agency Rept No. NSF-RA/E-72-001; Grant NSF-GI-26; May 72, 438 p.

LEAD; SOILS; AIR; WATER; PLANTS; PHOTOSYNTHESIS; ANIMALS; MATHEMATICAL MODEL; ANALYSIS; MODEL; METALS; MOVEMENT; TRACE METALS

The report constitutes a progress report of interdisciplinary research conducted to develop an understanding of the movement and effect of lead and other trace metals in the environment so that decisions regarding control of these possible pollutants might be made more rationally. Reports of the following six groups are presented: analytical laboratory, total ecosystem group, air-soil-water-plant continuum group, plant processes group, animal processes group, and modeling team.

6

Kampf gegen die Belastung der Gewaesser durch schwer oder nicht abbaubare Stoffe

In Foederation Europaeischer Gewaesserschutz, Informations blatt 19, 81 p. Proceedings of European Federal the Protection of Waters, Fifteenth Symposium; 1972, December

WASTE WATER; WASTE RECLAMATION; BIODEGRADATION; WASTE; AGRICULTURE; INDUSTRY; SEWAGE; SLUDGE; WATER; AIR; SOILS; DEGRADATION

Toxic and noxious substances which accumulate in water, soil, and air, and present a menace to public health are examined. The treatment of such substances totally or partially resistent to degradation, substances which are often contained in waste water and sewage sludge, are discussed. Intensification of research, development of economic and technical processes, utilization of wastes by agriculture, and reintroduction of industrial residues into the circuits of raw materials are stressed.

7

Chromium in Water - A Bibliography

; Office of Water Resources Research

National Technical Information Service, U.S. Dept. of Commerce, PB 210 921, 126 p.; 1972, June

ABSORPTION; BIBLIOGRAPHY; ANALYSIS; CHROMIUM; EFFLUENT; FERTILIZER; HEAVY METALS; MARINE ECOSYSTEM; NON-FERROUS METALS; PLATING; METAL FINISHING; RADIOACTIVE WASTES; RIVERS; ESTUARIES; SLUDGE TREATMENT; TEXTILE INDUSTRY; TREATMENT PLANT; UNDERGROUND AQUIFERS; WASTE DISPOSAL; WATER; SLUDGE

83 abstracts covering the period up to May 1972 with a significant description index and a title index. One of series of bibliographies based on selected Water Resources Abstracts.

8

Recommended Code of Practice - For the Handling and Disposal of Asbestos Waste Materials

; Asbestosis Research Council

The Asbestosis Research Council (Sep. 1969); 1969

ASBESTOS; LANDIFLLS; PACKING; WASTE DISPOSAL; WASTE TIPPING; WASTE COLLECTION; WASTES

Categorizes types of asbestos and methods of collecting wastes and disposal by tipping.

9

Lead. Airborne Lead in Perspective

; National Academy of Sciences, Washington, DC

Library of Congress Catalog Card No. 71-186214; International Standard book No. 0-309-01941-9; Monitoring Agency Rept. No. 18, 342 p.; 1972, March

BIOSPHERE; PRECIPITATION WASHOUT; AIR; PLANTS; ANIMALS; LEAD; LEAD POISONING; ANTIKNOCK TETRAETHYL LEAD; COST BENEFIT ANALYSIS; AEROSOLS; SOILS; DISEASES; FOODS; RESPIRATORY DISEASES; BLOOD CHEMISTRY; ECOSYSTEMS; HUMANS; REVIEW

A review containing information of interest to those concerned with the sources, magnitude, and distribution of airborne lead in the ecosystem and with its effects on human health and welfare, on plants, and on domestic and wild animals. It also presents useful information for clinicians and laboratory workers, describes sampling and analytic methods for lead, recommends procedures for the collection and storage of biologic samples, and summarizes toxicologic data on experimental lead poisoning.

10

Subsurface Water Pollution - A Selective Annotated Bibliography Part 3. Percolation from Surface Sources.

; Environmental Protection Agency

Environmental Protection Agency (U.S.), PB-211 342, 162 p.; 1972, March

ABSORPTION; ADSORPTION; BIBLIOGRAPHY; BIOCONVERSION; CHEMICAL ANALYSIS; EFFLUENT; GEOLOGY; INCINERATOR RESIDUES; LANDFILLS; LEACHING; LEACHATES; LYSIMETERS; MANAGEMENT; MINING; MUNICIPAL REFUSE; OILS; OXYGEN; PERMEABILITY; SEWAGE; SOILS; UNDERGROUND AQUIFERS; WASTE DISPOSAL; WATER; PERCOLATION

This is a selective bibliography representing a search of a 33,980 item data base, from the semimonthly journal, "Selected Water Resources Abstracts". Each item has a 150 to 200 word abstract.

11

Natural Curbs Limit Plant Intake of Arsenic Residues

Agr. Res., 18(11), 6; 1970

ARSENIC; RESIDUES; PLANTS; ROOTS; UPTAKE; ADSORPTION; LEACHING; POTTED CORN; IRON; ALUMINUM; ARSENATE; FATE; ORGANIC ARSENICALS; SOILS; LEAD; INSECTICIDES; CLAY; CORN; SANDY SOILS

Arsenic residues, which accumulate in the soil after repeated applications, are not generally harmful to plants because root uptake is limited by adsorption and leaching of the residues. When these mechanisms are not available, arsenic usually stunts the growth of plants or kills them before they accumulate significant residues. In an experiment with potted corn, 250 ppm arsenic reduced growth 50% in 4 weeks. Research is being conducted by the Agricultural Research Service in Beltsville, Maryland, on lessening the availability of arsenic to root systems by leaching or adding iron and aluminum, natural adsorbents for inorganic arsenate. The ultimate fate of organic arsenicals in soil is also being studied. Five to 15 ppm arsenic naturally occurs in most soils and some soils have up to 40 ppm. Concentrations of 10 to 2500 ppm were found in 70 samples of soil known to have had repeated and frequently heavy treatments of lead arsenate insecticide. In samples of sandy lakeland soil from Florida, taken from 1 to 6 ft deep, concentrations amounting to 48 lb/acre were found, but the top 12 inches contained 34 lb/acre, owing to leaching. Finer textured New York soil, high in clay content, containing slightly less aluminum and iron, accumulated more arsenic. Of applied arsenic, 47% remained in the top 6 in of New York soil, while 3% was found in the top 6 inches of lakeland soil.

12

Zinc in Soils of the Central Chernozem Region

Aderikhin, P.G.; Kopaeva, M.T.

Agrokhimiya, 3, 88-92; 1968

ZINC; SOILS; CHERNOZEM

Full tables are given of profile (0-150 cm) determinations of some physical and chemical soil properties and zinc contents of 11 soils. Total zinc in the plow horizon varied from 31 to 81 mg/kg.

13

Long-Lived Pollutants in Sediments from the Laguna Atascosa National Wildlife Refuge, Texas

Ahr, W.M.; Dep. Geol., Texas A And M Univ., College Station, Tex.

Geol. Soc. Amer. Bull.(BUGMAF) 1973, 88(8), 2511-15; 1973

DDT; SOILS; LEAD; ARSENIC; ORGANOCHLORINES; INSECTICIDES; SEDIMENTS

14

New Data on Mercury Geochemistry

Aidin'yan, N.K.; Ozerova, N.A.

Part of Chukhrov, F.V.(Ed.), Probl. Geol. Miner. Mestorozhd., Petrologii Mineral., Izd. Nauka, Moscow, USSR, 1, 191-199; 1969

GEOCHEMISTRY; MERCURY; ANALYSIS; CONCENTRATION; NEUTRON ACTIVATION ANALYSIS; ROCKS; MINERALS; WATER; MIGRATION; ADSORPTION; SOILS; RIVERS; SEA; OCEAN

Neutron activation analysis of mercury in rocks, minerals, and waters provided new data on the behavior of mercury in various geological processes. Cinnabar and native mercury are easily transferred into aqueous solution in amounts of 1.6 to 3.5 parts per million in the absence of strong oxidizers, but mercury migration in sedimentary rocks in insignificant because of adsorption by soils. Recent experiments showed that argillaceous schists extract 75 to 100 and dolomitized siltstones 30 to 1 percent of the mercury present in solution. These data greed well with the geological observation. The average mercury content in waters of rivers, seas, and oceans was 0.01 parts per million. The mercury is distributed nonuniformly in vertical section of soils: somewhat low mercury contents are typical of humus horizon and elevated of illuvial because of the presence of sorbents (iron and aluminum oxides).

15

Photochemical Formation of Methylmercuric Compounds from Mercuric Acetate

Akagi, H.; Takabatake, E.; Inst. Publ. Health, Tokyo, Japan

Chemosphere 2/3, 131-133; 1973

MERCURY; METHYLMERCURY; MERCURIC ACETATE; PHOTOCHEMICAL ALKYLATION; AQUATIC ECOSYSTEMS; MERCURIC CHLORIDE; ACETIC ACID; METHANOL; ETHANOL; METHYL CHLORIDE; ETHYLMERCURIC CHLORIDE; PROPIONIC ACID; ALCOHOL; FATTY ACIDS; DEGRADATION

In the course of studies on photochemical alkylation of inorganic mercuric compounds in aquatic environments, it was previously observed that irradiation with sunlight converted mercuric chloride into methylmercuric chloride in the presence of a small amount of acetic acid, methanol or ethanol, and into both methyl and ethylmercuric chlorides in the presence of propionic acid. Among these alcohols and fatty acids, acetic acid which occurs widely in nature as a degradation product of various organic materials, proved to be the most effective methyl donor for the formation of methylmercuric compounds. In this paper the authors describe a study of the photochemical methylation using mercuric acetate, a hypothetical intermediate of the reaction, under aqueous conditions. A 20 watt blacklight lamp having the same spectral distribution as sunlight was used to maintain a stable light intensity throughout the experiments. It was found that sunlight irradiation of mercuric acetate under aqueous conditions results in the formation of methylmercuric compounds, which explain the production in nature of methylated product from mercuric compounds under conditions where mercuric acetate is released.

16

Role of Complex Metal-Containing Organic Compounds in the Migration of Iron, Aluminium, Calcium, Magnesium, Potassium and Sodium Along the Profile of Gray Forest and Solodised Soils of the Central-Russian Steppe

Akhtyrtsev, B.P.; Kader, G.M.; Voronezhskii Gosudarstvennyi Universitet, USSR

Biologicheskie Nauki, 14(7), 106-111; 1971

MIGRATION; IRON; ALUMINUM; CALCIUM; MAGNESIUM; POTASSIUM; SODIUM; SOIL; HUMUS

Organic matter accumulates elements such as P, Ca and Mg in the humus horizon, while aiding the migration of other elements from the complex metal-containing organic compounds.

17

Copper Contents in the Organic Component of Podzol Type Soils

Aleshchukin, L.V.

Uch Zap Mosk Gos Pedagog Inst im Lenina 302 1968 Trans 11-17.

COPPER; PODZOL; SOILS

18

Nonbiodegradable and Other Recalcitrant Molecules

Alexander, M.; Lab. Soil Microbicl. Dept. Agronomy, Cornell Univ., Ithaca, N.Y. 14850

Biotechnol. Bioengineering, 15(4), 611-647; 1973

RESISTANCE; DEGRADATION; MICROORGANISMS; ORGANIC COMPOUNDS; MODEL; WATER; SOILS; COST/BENEFIT ANALYSIS; DEGRADATION; MICROORGANISMS; ECOSYSTEMS

Many natural products show remarkable durability in natural ecosystems, and some of these substances are of great practical concern. A variety of types of synthetic compounds are also persistent in nature, and this resistance is of importance because of the large amounts of such chemicals now manufactured and their effects in a variety of environments. The degradation of synthetic chemicals results mainly from activities of microorganisms, and attempts to minimize pollution of water and soil would be facilitated were there adequate information on why many pollutants are so refractory. Unfortunately, little is known about why manmade or even natural organic compounds are not destroyed at rates sufficiently repaid to prevent appreciable accumulations and occasionally ecological disturbances of considerable proportions. Environmental protection requires that a synthetic chemical should be converted to inorganic products in a reasonably short period of time. The material should, of course, not be subject to biodeterioration during the period it is being used for its intended purpose, but it should be destroyed once it is no longer needed and is introduced into waters, soils, or other disposal sites. Biodegradability of a compound often can be increased by appropriate structural modifications. These modifications can lead to replacement of compounds or manufactured products potentially dangerous in natural ecosystems and some that are undesirable for asthetic reasons with others which do not last sufficiently long in nature to be either hazardous or offensive. The cost of manufacture may be increased because of the additional requirement for biodegradability, but if society wishes to enjoy the benefits it now obtains from synthetic chemicals and yet have an environment free of toxic or offensive materials, it will have to accept the possible burden of additional cost. On the other hand, adequate knowledge of the mechanisms of recalcitrance may allow not only for a sound approach to the development of new chemical products but lead to new materials that can be produced with little or no added cost.

19

Soil Pollution

Alexander, M.

UNESCO and WHO. Global Impacts of Applied Microbiology. 4th International Conference. Sao Paulo, Brazil, July 23-28, 1973. 35 p. Unipub., Inc.; P.O. Box 433, New York, N.Y., U.S.A. 1973

MICROORGANISMS; PESTICIDES; HEAVY METALS; AIR; CARCINOGENS; SOILS

20

Agronomic Controls Over Environmental Cycling of Trace Elements

Allaway, W.H.

Advan. Agron. 20, 235-274; 1968

AGRONOMY; CYCLING; TRACE ELEMENTS

21

Heavy Metal Content of Plants Growing on Soils Contaminated by Lead Mining

Alloway, B.S.; Davies, B.E.; University of Wales

Journal of Agricultural Science, 76(2), 321; 1971, April

PLANTS; SOILS; LEAD MINING; CONCENTRATION; LEAD; ZINC; COPPER; ATOMIC ABSORPTION SPECTROPHOTOMETRY; UPTAKE; CROPS; ASH; HERBAGE

Plants grown in fields known to contain large concentration of lead, zinc, and copper were analyzed by absorption spectroscopy. Plants were washed, dried and dry washed at 430 degrees C. Ash was taken up in 0.1 N (H NO3) Nitric Acid. Control samples (6) were taken from areas known to be of low cation concentration and compared with five samples from mining fields. Generally, herbage from contaminated fields was richer in metals. Species and site differences control uptake and all parts of the plant are affected. Toxicity symptoms are no guide to plants metal content and maximum acceptable lead concentrations are exceeded in apparently healthy crops.

22
The Influence of Soil Arsenic on the Growth of Lowbush Blueberry

Anastasia, F.B.; Kender, W.J.; Procter & Gamble Co., Industrial Chemicals Div., Cincinnati, OH 45217

Journal of Environmental Quality, 2(3), 335-337; 1973

ARSENIC; INSECTICIDES; RESIDUES; PLANTS; SOILS; BLUEBERRY; CALCIUM ARSENATE

Samples of commercial and virgin soils taken from various lowbush blueberry (VACCINIUM ANGUSTIFOLIUM) areas in Maine contained measurable amounts of arsenic. The highest levels were in soils from commercial fields which had been treated repeatedly with calcium arsenate for insect control. The amount of arsenic decreased as the soil depth increased. Soils from commercial blueberry fields ranged from 7.7 to 37.8 ppm while virgin soils ranged from 5.7 to 7.0 ppm in the upper levels. Lowbush blueberry plants grown at arsenic levels of 7.7, 17.1, 43.8, 69.5 and 84.5 ppm in a loamy sand in the greenhouse were injured only at the highest level. At greater than or equal to 9.5 ppm arsenic blueberry plant growth was significantly inhibited when compared to plants grown at 7.7 ppm arsenic. The greatest arsenic accumulation in blueberry tissue occurred in the roots with decreasing amounts in the stems and leaves, respectively. When foliar arsenic reached 6.7 ppm, a significant reduction in plant growth resulted. Although arsenic was present in all field soils analyzed, at no point did the amount exceed that which was necessary to produce a reduction in plant growth under greenhouse conditions.

23
Analysis of Some Aromatic Hydrocarbons in a Benzene Soluble Bitumen From Green River Shale

Anders, D.E.; Doolittle, F.G.; Robinson, W.E.

Geochim Cosmochim Acta, 37(5), 1973, 1213-1228

PLANTS; BIOCHEMICAL RESIDUES; MASS SPECTROSCOPY; INFRARED SPECTROSCOPY; GAS CHROMATOGRAPHY; DEHYDROGENATION; BITUMEN; BENZENE; HYDROCARBONS; AROMATIC HYDROCARBONS; SHALE

24
System Simulation to Identifiy Environmental Research Needs Mercury Contamination

Anderson, A.A.; Anderson, J.M.; Mayer, L.E.

Oikos, 24(2), 231-238; 1973

FISH; SOILS; STREAMS; SEA; AIR; FOSSIL FUELS; COMBUSTION; FUELS; MERCURY

25
Effect of MUCOR-ALTERNANS on the Persistence of DDT and Dieldrin in Culture and in Soil

Anderson, J.P.; Lichtenstein, E.P.; Whittingham, W.F.

J. Econ. Entomol., 63(5), 1595-1599; 1970

PERSISTENCE; DDT; DIELDRIN; CULTURES; SOILS; INSECTICIDES

M. ALTERNANS isolated from a loamy soil incubated with DDT or dieldrin partially degraded DDT within 2-4 days in shake cultures into 3 hexanesoluble and 2 water-soluble metabolites. After application of Carbon 14-DDT, 42% of the totally recovered radioactivity was represented by the 2 water-soluble metabolites. There was some evidence of the breakdown of dieldrin, but no metabolites.

26
Incidence of Mercury in Illinois Pheasants

Anderson, W.L.; Stewart, P.L.; Illinois Nat. Hist. Surv., Urbana, Ill.

Trans. Ill. State Acad. Sci.(TISAAH) 1971, 64(3), 237-41; 1971

PHEASANT; MERCURY; BIRDS; SOILS

Pheasants (20) collected in east-central Illinois during August 1970 were analyzed for elemental mercury by emission spectrography and frequencies of occurrence and mean concentrations were kidneys, 35% and greater than 0.06 ppm, livers, 40% and 0103 ppm, brains 15% and 0.32 ppm, leg muscles, 25% and 0.02 ppm, and sternal muscles, 15% and 0.03 ppm. The high mean concentrations in brains was due to 5.93 ppm found in one bird. The 2nd highest individual concentration was 0.54 ppm and occurred in kidneys. Eight soil samples, collected from the fields in which the pheasants were taken, contained a mean of 0.02 plus - 0.01 ppm Hg. Neither pheasants nor soils in east-central Illinois appear to be contaminated with potentially dangerous levels of Hg.

27
Mercury in Soils

Andersson, A.

Grundforbattring, 20, 95-105; 1967

SOILS; HUMUS; PH; BOGS; PODZOL; HYDROMORPHIC; MERCURY

Average mercury content in 273 Swedish and 14 African soils was 60.1 and 23 ng/g, respectively. Cultivated soils generally contained more mercury than did uncultivated soils, although both the maximum (922 Mg/g) and the minimum (4 ng/g) contents were found in uncultivated soils. Mercury content of the surface soil was 5-10 times higher than that of the subsoil (average 2-10 ng/g). Mercury was adsorbed mostly on the humus fraction at low pH values and on the mineral colloids at higher Ph's. Graphs show the distribution of mercury with depth in profiles of a raised bog, and podzol and a hydromorphic soil.

28
Enrichment of Trace Elements from Sewage Sludge Fertilizer in Soils and Plants

Andersson, A.; Nilsson, K.O.; Department of Soil Science, Aricultural College of Sweden, Uppsala, Sweden

Ambio, 1(5), 176-179; 1972, October

TRACE ELEMENTS; SEWAGE SLUDGE; SOILS; PLANTS; MANGANESE; ZINC; COPPER; NICKEL; COBALT; CHROMIUM; LEAD; CADMIUM; MERCURY; MOLYBDENUM; ARSENIC; BORON; SELENIUM; NEUTRON ACTIVATION ANALYSIS; COLORIMETRY; ATOMIC ABSORPTION SPECTROPHOTOMETRY

Soils are more easily aerated than water, consequently oxygen depletion is not the same problem. The soil can receive large amounts of organic matter per unit volume that can be decomposing without the harmful effects from anaerobic and reducing conditions that occur in the aquatic environment. The plant nutrients released by the decomposition process increase the production of new organic material which is harmful in the water environment, but in soils--and in cultivated soils in particular--the same effect is favorable. When wastes are decomposed by microorganisms in the soil, plant nutrients are released and made available to the plant roots. They can be used in the production of new organic material and the result will be increased yields. So far there have been no problems in using the soil for disposal of sewage sludeg. However, sewage sludge also contains hazardous components of domestic and industrial origin. As sludge decomposes, these elements are released along with plant nutrients and become sorbed to the soil colloids. The sorption is strong enough to protect them from leaching, but to some extent they are still available to the plant roots. The effect is a gradual enrichment of the soil and in some cases increased resorption by plants and transference to the food chains. When municipal waste products are to be used for agricultural purposes, the application rates recommended should be based on the content of potentially harmful components. The Uppsala sewage sludge contained high contents of zinc, copper, mercury and selenium in amounts greater than in the soil. The extractable mercury, zinc, copper, and selenium were increased by more than 100 percent and nickel, chromium and lead by more than 50 percent. In the vegetation grown on the soil, zinc, copper, arsenic, nickel, chromium, mercury and molybdenum were increased by 50 percent or more. Arsenic, manganese and cobalt increased in the vegetation by a greater percentage than the increase in the soil and many other elements by about the same percentage.

29
Mercury in Nature

Andersson, A.; Wiklander, L.

Grundfoerbatbring 18, 171-177; 1965

MERCURY; CYCLING

30
Contents of Mobile Copper and Zinc in Sod Podzolic Soils of Western Polesie

Andrushchenko, G.A.; Dzyaman, T.D.

Mikroelem Sel'Sk Khoz Med 5 1969 Trans 124-132.

COPPER; ZINC; SOD PODZOLIC SOILS; SOILS

31
Mathematical Model for Migration of Radiostrontium in Soil

Anochin, V.L.; Svirezhev, J.M.; Tjurjukanow, A.N.

Aberg. V.; Hungate, F.P. (Eds.), Proc. of Intern. Symp. on Radioecological Concentration Processes, Stockholm, April 25-29, 1966. Pergamon Press, Oxford (1040 p.); 1966

MODEL; MATHEMATICAL MODEL; SOILS; STRONTIUM; TRANSPORT; RADIONUCLIDES; RADIOSTRONTIUM

32
The Movement of Copper in Soils

Antipov-Karotaev, I.N.

Pedology (USSR), 652-659; 1947

MOVEMENT; COPPER; SOILS

33
Pathway of Agrochemicals. Mercury in Soils

Aomine, S.

Kagaku (Tokyo), 37(12), 651-656; 1967

AGROCHEMICALS; MERCURY; SOILS; MOVEMENT

34
Retention of Mercury by Soils. 2. Adsorption of Phenylmercuric Acetate by Soil Colloids

Aomine, S.; Inoue, K.

Soil Sci. & Plant Nutr. 13, 195-200; 1967

MERCURY; SOILS; COLLOIDS; PHENYLMERCURIC ACETATE; ADSORPTION; RETENTION

35
Moisture Effect on Zinc Solubility in Soil and on Its Absorption by Maize

Armeanu, F.; Stan, S.; Borlan, Z.

Stiinta, 9(2), 9-16; 1971

ADSORPTION; SOLUBILITY; SOIL MOISTURE; MAIZE; CHERNOZEM; IRON; MANGANESE; ZINC; COPPER; ZINC 65; LEACHING; SOILS; UPTAKE

On a weakly acid leached chernozem iron and manganese solubility increased and zinc and copper solubility decreased under excessive moisture conditions. In pot experiments soil moisture had a negative effect on zinc-65 uptake by maize.

36
The Determination and Distribution of Toxic Levels of Arsenic in a Silt Loam Soil

Arnott, J.T.; Leaf, A.L.

Weeds, 15(2), 121-124; 1967

DETERMINATION; DISTRIBUTION; ARSENIC; SILT LOAM; SOILS; LOAM

37
Preliminary Studies on the Adsorption of Arsenite in Punjab and Haryana Soils

Arora, S.K.; Singh, M.; Vaid, K.K.

Indian J. Sci. Ind., 1, 139-141; 1967

ADSORPTION; ARSENITE; SOILS; ORGANIC MATTER; CLAY SESQUIOXIDES; ARSENIC

The adsorption of arsenic by soils was affected mainly by organic matter, but also by clay percentage and amount of sesquioxides.

38
Solubilization of Iron Containing Minerals by Soil Microorganisms

Arrieta, L.; Grez, R.

Appl. Microbiol., 22(4), 1971, 487-490

FUNGI; THIN LAYER CHROMATOGRAPHY; SOILS; IRON

39
Photodecomposition and Stability of Formetanate

Arurkar, S.K.; Knowles, C.O.

Trans. Mo. Acad. Sci. 5, 1971 (Recd 1972), 38-42

ACARICIDE; INSECTICIDES; PHOTODECOMPOSITION; FORMETANATE

40
Decomposition of Formetanate Acaricide in Soil

Arurkar, S.K.; Knowles, C.O.; Missouri University, Columbia, Missouri

Bull. Env. Contam. Toxicol., 5, 324-328; 1970

DECOMPOSITION; FORMETANATE; SOILS ACARICIDE; DEGRADATION; PH

In river bottom soil of pH 8, formetanate decomposition was rapid and the major identified degradation products were m-formaminophenyl-N-methylcarbamate, m-formaminophenol, and m-aminophenol. When formetanate was incubated with Tris-HC1 buffer (pH 7.4) for 4 hours, the same materials appeared as predominant hydrolysis products. In soil, the formetanate concentration decreased from 53.7% at 1 day to 10.4% after 16 days.

41
Environmental Pollution by Chromium Slag Brought to the Reclaimed Land by Filling

Asami, T.; Univ. Tokyo, Tokyo, Japan

Nippon Dojo-Hiryogaku Zasshi (NIDHAX), 1973, 44(6), 223-225; 1973

SOILS; RECLAMATION; CHROMIUM; SLAG; WATER; GOBY; FISH

42
Pollution of Paddy Soils by Cadmium, Zinc, Lead, and Copper in the Dust, Fume, and Waste Water from Nisso Aizu Smelter

Asami, T.; University of Tokyo, Tokyo, Japan

Nippon Dojo-Hiryogaku Zasshi (Nidhax), 43(9), 339-43; 1972

SOILS; SMELTERS; CADMIUM; ZINC; LEAD; COPPER; DUSTS; FUMES; WASTEWATER; PADDY SOILS; PADDIES

43
Nickel Pollution

Ashton, W.M.; Dept. of Biochemistry and Agricultural Biochemistry, University College of Wales, Aberystwyth, Wales

Nature, 237, 46-47; 1972, May 5

NICKEL; HERBAGE; COPPER; ARSENIC; SOILS; WHEAT; OATS; POTATOES; GRASSES; ATOMIC ABSORPTION SPECTROPHOTOMETRY; COLORIMETRY; CONCENTRATION

Samples of soils and herbage from near a nickel refinery in Wales in 1934, showed considerable contamination of soils and herbage by nickel, copper, and traces of arsenic. In oats and wheat the leaves showed by far the greatest contamination but some of it washed off. Herbage, trees and livestock were in poor condition in this area. In 1940, a new much cleaner process of nickel extraction was adopted and soil and vegetation samples taken in 1971 showed a marked decrease in contamination.

44
Concentration Effects on Cesium-137, Zinc-65, Cobalt-60, And Ruthenium-106 Sorption by Marine Sediments, with Geochemical Implications

Aston, S.R.; Duursma, E.K.; Int. Lab. Mar. Radioact., Iaea, Monaco

Neth. J. Sea Res. (NJSRBA), 1973, 6(1-2), 225-40; 1973

FALLOUT; SEA; SEDIMENTS; CESIUM 137; ZINC 65; COBALT 60; RUTHENIUM 106; SORPTION; MARINE; SEA WATER; WATER; GEOCHEMISTRY

45

Understanding the Dynamic Behavior of Radionuclides Released to the Environment and Implications

Auerbach, S.I.; Kaye, S.V.; Nelson, D.J.; Reichle, D.E.; Dunaway, P.B.; Booth, R.S.; Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830

A/CONF-49/P-85, Prepared for Fourth International Conference on the Peaceful Uses of Atomic Energy, Geneva, Switzerland, September 6, 1971, 18 p.; 1971, September

HYDROLOGY; TRANSPORT; TRITIUM; ANTIMONY 125; CESIUM 137; COBALT 60; RUTHENIUM 106; STRONTIUM 90; ZINC 65; FALLOUT; CHEMICAL ANALYSIS; FISSION PRODUCTS; RADIONUCLIDES; ACTIVATION ANALYSIS; PLANTS; SOILS; CERIUM 144; NIOBIUM 95; ZIRCONIUM 95; DIFFUSION; INTERACTIONS; CALCIUM 45; IODINE 131; POTASSIUM 42; RUBIDIUM 86; SODIUM 22; STRONTIUM 85; FOOD CHAINS; MONITORING; RADIATION DOSES; RADIATION; CORREALTION; FISH; CRUSTACEANS; MOLLUSKS; INSECTS; MOVEMENT; TERRESTRIAL ECOSYSTEMS; GRASSLAND; FOREST

The environmental behavior of radionuclides released to aquatic and terrestrial ecosystems from both routine plant operations and tracer experiments at Oak Ridge National Laboratory (ORNL) has been studied by ecologists during the past 15 years. Two important aspects of these continuing studies are: (1) radionuclides used as tracers in the environment help to delineate complex ecological processes and (2) radiolabels quantifying rate processes provide primary ecological information for developing dynamic models of radionuclide transfers to man. Systems analysis techniques are being used to simulate the environmental behavior of radionuclides. Chronic releases of small quantities of radionuclides to White Oak Lake and the Clinch River have provided a unique case study of the environmental behavior of several radionuclides. Radionuclides occurring regularly in organisms from White Oak Lake include Sr 90, Cs 137, Co 60, and H 3. Occasionally Ru 106, Sb 125, and Zn 65 are found. Because of dilution, only Sr 90 and Cs 137 are found regularly in the Clinch River. Coupling of field and laboratory data on selected radionuclides in fish, aquatic insects, mollusks, and crustaceans provides the necessary parameters for dynamic models of radionuclide movements in aquatic ecosystems. Research in terrestrial ecosystems has emphasized the biogeochemical cycling of fission products in forest, grassland, and old field ecosystems. Radionuclide dynamics (Co 60, Sr 90, Sr 95-Nb 95, Ru 106, Cs 137, and Ce 144) in natural plant communities have been followed where soil reaction products have formed. Plant translocations and food-chain studies with Na 22, K 42, Ca 45, Sr 85, Rb 85, I 131, and Cs 137 have detailed pathways and fluxes of additional radionuclides in these ecosystems. Research has provided insight into the budgets and turnover times of major nutrient elements and potentially hazardous radionuclides in contrasting ecological systems. Fifteen years of environmental research at ORNL strongly suggests that the dose necessary to evoke an unequivocally detectable biological response is considerably greater than that resulting from maximum permissible concentrations in the environment.

46

Restitution to the Soil of Mineral Elements by Litter Fall and Precipitation in 4 Forest Stands in Eastern France

Aussenac, G.; Bonneau, M.; Le Tacon, F.

Oecol. Plant, 7(1), 1972, 1-21

NITROGEN; POTASSIUM; PHOSPHORUS; CALCIUM; MANGANESE; COPPER; BORON; SOILS; LITTER FALL; MINERALS; FORESTS

47

Possible Microbial Contribution to Nitrosamine Formation in Sewage and Soil

Ayanaba, A.; Verstraete, W.; Alexander, M.; International Institute of Tropical Agriculture, P.M.B. 5320, Ibadan, Nigeria

J. Natl. Cancer. Inst., 50(3), 1973, 811-813

MICROORGANISMS; DIMETHYLAMINE; DIMETHYL NITROSAMINE; THIRAM; FUNGICIDES; SEWAGE; SOILS; TRANSFORMATION; TRIMETHYLAMINE; DMA

Microorganisms is sewage converted trimethylamine to dimethylamine (DMA) and also produced dimethylnitrosamine. DMA formation was solely the result of microbial activity. Most of the nitrosamine generated from added DMA and nitrite at neutral pH was consequence of microbial metabolism. The nitrosamine also formed in acid soil from DMA and in acid sewage from the fungicide thiram. Although nitrosamines have not yet been found, or actively sought, in unamended sewage or soil, these findings indicate a potential for their formation in such environments.

48

Influence of Phosphorus Buildup on Availability of Micro Nutrients in Red Soils of Bangalore

Badanur, V.P.; Venkata Rao, B.V.

Soil Sci., 116(4), 1973, 292-294

ZINC; COPPER; MANGANESE; MICRONUTRIENTS; SOILS; PHOSPHORUS; AVAILABILITY

49

Hydrolytic Behavior of Toxic Metals

Baes, C.F.; Mesmer, R.E.; Oak Ridge National Laboratory, Oak Ridge, TN 37830

Part of Ecology and Analysis of Trace Contaminants, Progress Report, June 1972-January 1973, ORNL-NSF-EATC 1, NSF and Oak Ridge National Laboratory, Oak Ridge, TN, (p.227-245) 449 p.; 1973

PH; HYDROLYSIS; OXIDES; HYDROXIDES; MERCURY; ZINC; CADMIUM; COPPER; BERYLLIUM; LEAD; TIN; BISMUTH; ARSENIC; ANTIMONY; MOLYBDENUM; CHROMIUM; SELENIUM; VANADIUM; COBALT; NICKEL; MANGANESE; THALLIUM; HYDROLYTIC BEHAVIOR

Most metal ions hydrolyze in solutions of intermediate pH to produce a set of hydroxy complexes, M(x) (OH) (y) (nx-y), whose identities are often unresolved and whose distributions depend on both metal ion concentration and pH. Identification of the formula and charge of these hydrolysis products is essential to understanding important aspects of the chemistry of the element. In fiscal year 1973 we have selected ten important toxic metal ions for a critical review of the extensive literature on their hydrolysis behavior. These are: Hg^{2+}, Zn^{2+}, Cd^{2+}, Cu^{2+}, Be^{2+}, Pb^{2+}, Sn^{2+}, Bi^{3+}, As(III) and Sb(III). Reviews of the first six of these are now complete so that the identity of the significant hydrolysis species has been judged and the best values selected for equilibrium quotients relating these to the acidity and the solid oxide and hydroxide phases which occur. The review of Cd^{2+} is complete but the data will be reported later. This information will be made available to researchers in the field through review articles. A program of experimental work deemed necessary to fill in gaps in the knowledge of hydrolytic behavior of the first six metal ions is proposed at a one man year level. In addition we propose at some future time the extension of such a review to the ions of approximately eight more metals including Mo, Cr, Se, V, Co, Ni, Mn, and Tl.

50

Radioisotope Migration in Soil

Baetsle, L.; Maes, W.

Pedologie, 14, 205-227; 1964

MIGRATION; RADIOISOTOPES; SOILS

51

Computational Methods for the Prediction of Underground Movement of Radionuclides

Baetsle, L.H.

Nuclear Safety, 8, 576-88; 1967

RADIONUCLIDES; MOVEMENT PREDICTION; MATHEMATICAL MODEL; UNDERGROUND; MOVEMENT; UNDERGROUND MOVEMENT; MODEL

52

Storage and Disposal of Iron Ore Processing Wastewater

Baillod, C.R.; Alger, G.R.; Michigan Technological University, Dept. of Civil Engineering, Houghton, MI

U.S. Environmental Protection Agency, Research and Development Report Number EPA 660/2-74-018; 1974, March

WASTEWATER; IRON ORE; TAILINGS BASIN; EFFLUENTS; TRANSPORT; PLANTS; WATER; PRECIPITATION; OUTFLOW; SEEPAGE; TICKENING; SLURRIES; TAILINGS; ORE; HYDROLOGY; COAGULATION; IMPOUNDMENTS; MINE WASTES; SEDIMENTATION WASTES; INDUSTRIAL WASTES; TACONITE WASTES; VACUUM FILTRATION; WATER

This study was concerned with the handling of wastewater resulting from the concentration of low grade iron ore. Specific objectives were to develop tailings basin design and management criteria, to investigate methods of treating basin effluents, and to investigate transport characteristics of particulate materials contained in basin discharges. These objectives were accomplished through laboratory and field studies conducted at the tailings impoundment systems associated with two iron ore concentrating plants located in Upper Michigan. Annual water balances were formulated for the tailings system at each plant to show the relative importance of precipitation, surface outflow and seepage. Settling column and dye dispersion tests were employed to predict concentrations of suspended material remaining in basin effluents. The cost effectiveness of various coagulation systems for treating basin effluent was investigated. Particular attention was devoted to a study of the thickening and dewatering characteristics of the slurry produced by chemical coagulation of the basin effluent. Synthesis of alternative systems for handling tailings wastewater was hampered by a lack of information on water quality requirements for reuse within ore concentrating processes. Finally, settling column experiements in which fine tailings particles were diluted with various natural waters were conducted.

53

A New Approach to Soil Testing. Part 2. Ionic Equilibria Involving Hydrogen, Potassium, Calcium, Magnesium, Manganese, Iron, Copper, Zinc, Sodium, Phosphorus and Sulfur

Baker, D.E.

Soil Sci. Am. Proc., 37(4), 1973, 537-541

DIETHYLENETRIAMINE PENTAACETIC-ACID; ION AVAILABILITY; HYDROGEN; POTASSIUM; CALCIUM; MAGNESIUM; MANGANESE; IRON; COPPER; ZINC; SODIUM; PHOSPHORUS; SULFUR; SOIL ANALYSIS

54

The Role of Humic Acids from Tasmanian Podzolic Soils in Mineral Degradation and Metal Mobilization

Baker, W.E.

Geochim. Cosmochim. Acta., 37(2), 269-281; 1973

SULFIDE; HUMIC ACIDS; DEGRADATION; MOBILIZATION

55
Loss of 2,4-D in Washoff from Cultivated Fallow Land

Barnett, A.P.; Hauser, E.W.; White, A.W.; Holladay, J.H.

Weeds, 15(2), 133-37; 1967

2,4-D; WASHOFF; SOILS; FALLOW LAND; CULTIVATION

56
Quantitative Correlation of Trace Elements Between Soils and Motherrock

Barragna, L.E.; Iniguez, H.J.; Fac. Farm., Univ. Navarra, Navarra, Spain

An. Edafol. Agrobiol.(AEDAAB), 1973, 32(1-2), 89-97; 1973

SOILS; ROCK; TRACE ELEMENTS; IRON; CORRELATION; COPPER; MOTHERROCK

57
On the Displacement of Adsorbed Anions from Soil: 2. Displacement of Phosphate by Arsenate

Barrow, N.J.; CSIRO, Division of Plant Industry, Wembley, Western Australia

Soil Science, 117(1), 28-33

SOILS; ARSENATE; PHOSPHATES; PH; ARSENIC ACID; LITHIUM; SODIUM; POTASSIUM; CATIONS

The ability of solutions of arsenate to displace previously adsorbed phosphate from soil was investigated. Displacement increased with concentration of arsenate, with time of shaking, and with pH. There was a marked change in slope of the pH-displacement curve near the pK_2 of arsenic acid. This was taken to indicate that arsenate was competitively displacing specifically adsorbed phosphate. At equivalent concentration the effectiveness of arsenate decreased in the sequence: lithium, sodium, potassium. These differences may be associated with differences between the cations in their average distance of approach to a negatively charged surface. With increasing time of contact between soil and phosphate, the proportion of the added phosphate which was not displaceable by arsenate slowly increased. The rate of conversion to a nondisplaceable form increased with temperature. The conversion occurred over a wide range of soil moisture levels. The proportion converted was not affected by level of addition within the range tested, and it was argued that this indicates that conversion does not involve diffusion of phosphate from one site to another through the solution phase.

58
Contribution to the Study of Equilibria Between Soils and Solutions of Some Arsenic and Phosphorus Compounds

Bastisse, E.M.

Science, 98(1), 5-17; 1967

EQUILIBRIUM; SOILS; ARSENIC; PHOSPHORUS

To 160 mg As and P_2O_5 as KH_2ASO_4 and KH_2PO_4, respectively, 2000 ml distilled or tap water were added with and without 200 g soil from 5 different sources. After 30 minutes on a mechanical shaker, phosphorus and arsenic were determined in the decanted, clear supernatant liquid. More water was then added to the remaining solutions and the procedure was repeated up to 100 times. The first decantation always contained more arsenic than phosphorus, showing that fixation of phosphorus by all soils was greater than that of arsenic. Only 63 and 83% of the total added P_2O_5 and arsenic, respectively were recovered, even after 100 decantations. Similar tests with an arsenic-silicon compound showed that up to 135/litre arsenic are still recovered in the washings after 50 decantations.

59
Interaction Between Montmorillonite Clay and Trace Element Cations [illegible]. Exchange Behavior of Cobalt, Nickel and Chromium Ions in Clays

Basu, A.N.; Mukherjee, S.K.; University Colleges of Science & Technology, Calcutta, India

Journal of the Indian Society of Soil Science, 13, 251-256; 1965

COBALT; NICKEL; CHROMIUM; ADSORPTION; SOILS

The exchange isotherms of Ni-, Co-, and Cr-clays were obtained against Na, K, NH_4, H, Mg and Al ions. In general, the following order of release is shown: Co equal to Ni greater than Cr. The sequence of adsorption is the reverse of it. These sequences are more or less in agreement with the lyotrope series. The exchange behavior of H ion is anomalous, as has often been observed in the case of similar colloidal reactions. The exchange behaviors of NH_4 and K, and Co and Ni ions, each pair having nearly identical radii, are nearly the same.

60
Determination of Cesium 137 in Soil

Bauman, A.; Snyder, W.S.; Abee, H.H.; Burton, L.K.; Naushart, R.; Benco, A.; Duhamel, F.; Wheatley, B.M. (Eds.); Institute for Medical Research, Zagreb, Germany

CONF-660920, From First International Congress of the International Radiation Protection Association, Rome, Italy, (p. 335-338); 1968

CYANIDE; DETERMINATION; GAMMA SPECTROMETERS; LEACHING; PHENYL RADICALS; PRECIPITATION; SOILS; BORON OXIDES; CESIUM 137

The method is based on the final precipitation of Cs 137 as cesium triphenylcyanoborate. Sodium triphenylcyanoborate has not been used before as a reagent for determination of radioactive cesium, at least not in the samples of biosphere. Conditions of optimal leaching of Cs 137 from various types of soil were found. A 256-channel analyzer was used for sample counting. Conditions of optimal precipitation of cesium were determined.

61
Reduction of Inorganic Compounds by Soil Microorganisms

Bautista, E.M.; Alexander, M.; Cornell University, Ithaca, New York

Soil Science Society of America Proceedings, 36(6), 918-920; 1972

SOILS; REDUCTION; RESTING CELLS; CELLS; IONS; SELENATES; SELENITE; TELLURATE; TELLURITE; VANADATE; VANADYL; MOLYBDATE; MOLYBDENUM; ARSENATE; ARSENIC; MANGANESE OXIDES; MANGANOUS ION; CHLORATE

Growing cultures, resting cells and cell extracts of two soil isolates, PICHIA GUILLERMONDII and a MICROCOCCUS species, reduced several inorganic ions and compounds. The capacity to reduce selenate, selenite, tellurate and tellurite to elemental forms, vanadate to a vanadyl compound, molybdate and molybdenum trioxide to a molybdenum blue compound, arsenate to arsenite, MnO_2 to the manganous ion, and chlorate to a less oxidized form, was common to soil microorganisms.

62
Co Metabolism as a Factor in Microbial Degradation of Cycloparaffinic Hydrocarbons

Beam, H.W.; Perry, J.J.; Dept. Microbiol., North Carolina State Univ, Raleigh, NC

Archives fur Mikrobiol. 1973, 9(1), 87-90; 1973

CARBON; CARBON 14; COBALT; METABOLISM; MICROBIAL DEGRADATION; DEGRADATION; CYCLOPARAFFINIC HYDROCARBON; SOILS; CYCLOHEXANE; ENERGY; CARBON DIOXIDE; CYCLOALKANONE; PROPANE; CYCLOPARAFFIN; CARBON MONOXIDE

All attempts to isolate microorganisms from soil that utilize unsubstituted cycloparaffinic hydrocarbons, e.g. cyclohexane, as sole Course of carbon and energy have been unsuccessful. However, cyclohexane was degraded in fertile soil as measured by release of C14 carbon dioxide on addition of UL C14 cyclohexane. Hydrocarbon utilizing organisms isolated from the soil grew rapidly on cycloalkanones. Several cultures, after growth on propane, could oxidize cycloparaffins to the homologous cycloalkanone. These results suggest that degradation of cycloalkanes in nature may be via Co metabolism.

63
Contamination of Soil With Zinc, Copper, Lead, and Cadmium in the Wollongong City Area

Beavington, F.

Aust. J. Soil Res., 11(1), 1973, 27-31

SOILS; ZINC; COPPER; LEAD; CADMIUM

64
The Significance of a Biologically Active Soil

Beckman, E.O.

Vitalst Zivilisationskr, 15(5), 181-184; 1970

MICROFLORA; AGRONOMY; HERBICIDES; SOILS; ENZYMES

65
Using Soil Filtration to Reduce Pollution Potential of Lagoon Effluent Entering Ground Water System

Beer, C.E.; Koelliker, J.K.

PB-203 348, Iowa State Water Resources Research Inst. 37 p.; 1971, August

SOILS; FILTRATION; LAGOON; EFFLUENTS; GROUND WATER; WATER

66
Surface Charge Characteristics of Hydroxyapatite and Fluorapatite

Bell, L.C.; Posner, A.M.; Quirk, J.P.

Nature 239, 515-517; 1972

HYDROXYAPATITE; FLUORAPATITE; SURFACE CHARGE; MINERALS

67
Biodehalogenation--the Metabolism of the Nematocides Cis- and Trans-3-Chloroallyl Alcohol by a Bacterium Isolated from Soil

Belser, N.O.; Castro, C.E.; University of California, Riverside, CA

J. Agric. Food Chem. 19, 23-26; 1971

BIODEHALOGENATION; METABOLISM; NEMATOCIDES; CHLOROALLYL ALCOHOL; SOILS; CARBON DIOXIDE; CHLORINE ISOMERS; HYDROXYLATION

The metabolic path for the conversion of the isomers to CO_2 and Cl^- by a PSEUDOMONAS species is given. The dehalogenation step for each of the isomers is a direct hydroxylation of the beta-vinylie carbon-chlorine bond of the isomeric 3-chloroacrylic acid intermediates.

68
Mobile Copper in tte Soils of the Cherkassy Region

Benders Kyi, R.M.; Khomchak, M.Y.

Zb. Nauk. Prats'. Umans'K. Sil'S'K. Inst., 15, 1967 Trans., 312-317.

COPPER; SOILS

69
Re-Establishing Apple Orchards in the Chelan-Manson Area

Benson, N.R.

Washington State University, Tree-Fruit Research Center, Wenatchee, WA, Report, Oct. 1968, 32; 1968

APPLES; APPLE ORCHARDS; SOILS

70
Zinc Retention in Soils

Benson, N.R.

Soil Sci., 101, 171-179; 1966

ZINC; SOILS; RETENTION

71
Soil Transformations of the Individual Ingredients in Waste Waters from the Manufacture of Polyvinyl Chloride Resins, and the Effect of these Compounds on the Physical and Chemical Properties of the Soil

Berezneva, L.A.; Mazina, E.I.

Tr. Klar'kov. Sfl'skokhoz. Inst. (TKKSAD),, 166, 28-32; 1972

VINYL CHLORIDE; WASTES; SOILS; NITRIFICATION; METHYL CELLULOSE; WATER; TRANSFORMATION

72
Lead Absorption from Soil Into Legumes-D

Berg, M.M.

J. Minn. Acad. Sci. 36 (2-3), 96; 1970

BEANS; PEANUTS; LEAD; SOILS; LEGUMES; ABSORPTION; PLANTS

73
Dynamics of Soluble Forms of Copper in Soils

Berina, D.; Renberga, L.

; 1965

COPPER; SOLUBILITY; SOILS; LOAM; SAND; RAINFALL; SOIL MOISTURE

In a sandy derno-gley soil, a sandy dorno-podzolio-gleyey soil, a sandy-loamy cultivated derno slightly pdozolic soil, and a loamy cultivated derno-carbonate soil from four regions of Latvia, variations in the proportion of acetate-soluble copper in the total copper were within the range of several per cent, whereas variations in the percentage of copper soluble in the HCl ranged from several tens of per cent to one hundred per cent. The concentration of soluble forms of copper increased in water-saturated soil in early spring and in summer after heavy rain. The concentration of soluble copper was least at the beginning of the vegetative period, and soils poor in copper should be dressed with copper in spring.

74
Lead Content of Soils from Urban Housing

Bertinuson, J.R.; Clark, C.S.; College of Medicine, University of Cincinnati, Cincinnati, OH

Interface (Cleveland) (ITFCBH) 2(1), 6; 1973

LEAD; URBAN; SOILS; URBAN HOUSING

75
Interactions Between Mineral Elements and Soil Micro-Organisms

Bertrand, D.; Institut Pasteur, 78-Jouy-en-Josas, France

Revue d'Ecologie et de Biologie du Sol, 9(3), 349-396; 1972

INTERACTIONS; MINERALS; SOILS; REVIEW; NUTRITION; METALLO-ENZYMES; NITRATE; SILICATES; CARBONATES; PHOSPHATES; SULFUR; IRON; MANGANESE; REVIEW

Subjects discussed include the effect of mineral elements on the metabolism of soil micro-organisms (growth, nutrition and toxicity, metalloenzymes), and the effect of soil micro-organisms on the mineral environment (nitrates, silicates, carbonates, phosphates sulphur, iron and manganese).

76
Some Data on Atmospheric Pollution with the Arsenic from the Smoke Cases of Electric Power Stations in Rostov Province

Bespalov, A.I.; Bolovina, V.N.; Kosorotova, F.P.

Gigiena I Sanit., 34(10), 111-2; 1969

SMOKE; GASES; POWER PLANTS; COAL; ARSENIC; THERMAL ELECTRIC POWER STATIONS; CHIMNEYS; DISPERSION ATMOSPERE; AIR

The smoke gases from Kostov Province Electric Power Stations burn the local coal arsenic. The concentration of the latter in the breathing zone at a distance of 1 km exceeds the maximum permissible concentration. The presently projected decrease in atmospheric pollution from the discharges of thermal electric and state regional thermal electric power stations by increasing the height of chimneys (greater dispersion) will lead to a decrease in the level and content of arsenic in the surface layer of the atmosphere.

77
Data on Atmospheric Population by Arsenic from Flue Gases of Power Plants in the Rostov Region

Bespalov, A.I.; Bolovina, V.N.; Kosoorotova, F.P.

Hyg. Sanit., 34(10-12), 133-5; 1969

ARSENIC; FLUE GASES; ATMOSPHERE; AIR; POWER PLANTS; GASES

78
Retention of Cu and Zn by H-montmorillonite

Bingham, F.T.; Page, A.L.; Sims, J.R.

Soil Sci. Soc. Am. Proc., 28(3), 351-354; 1964

COPPER; ZINC; RETENTION; MONTMORILLONITE;: SOILS; MINERALS

79
Transport Phenomena

Bird, R.B.; Stewart, W.E.; Lightfoot, E.N.

John Wiley & Sons, Inc.,; New York, NY, 455; 1958

TRANSPORT

80
The Uptake of Applied Selenium by Agricultural Plants. 1. The Influence of Soil Type and Plant Species.

Bisbjerg, A.; Gissle-Nielsen, G.; Danish Atomic Energy Commission, Risde, Denmark

Plant Soil, 31, 287-298; 1969

ABSORPTION; AGRICULTURE; CEREALS; PLANTS; SOILS; TISSUE; VARIATIONS; POTASSIUM COMPOUNDS; SELENIUM OXIDES; SELENIUM 75; BARLEY; CLOVER; LEGUMINOSAE; RYE; PLANT UPTAKE

A comparison of plants grown on 6 soils showed that their ability to take up Se 75 varied by one order of magnitude when potassium selenate was the source of Se 75 and by a factor of 5 when selenite was the source. The uptake of selenate was, on an average, 8 times that of selenite. Five of the 6 soils used were representative of the greater part of the Danish agricultural area while one of them was a special case. The effect of selenium application was found to be much the same in the common soils although the concentration in the plants was sometimes twice as high on sandy as on loamy soils. For most areas concentration of Se 75 in the plant was roughly inversely related to the clay content of the soil. The Se 75 concentration in the plants varied with their stage of development. In barley the concentration was lower in straw and grain than in the green plant, in mustard it depended on the oxidation state of the Se. Grain and seed, in general, contained more Se than the straw. Of 10 plant species the cereals to be favored by an excess of available Se while at moderate levels rye grass was a better accumulator than the clover. Whent the selenate addition was increased by a factor of 25, the plant level of Se 75 increased 70 fold; for selenite the factor was 50. The application of 0.1 ppM selenite-Se or somewhat less selenate leads to a useful Se level in plants in pot experiments. (BBB)

81
Studies on Selenium in Plants and Soils

Bisbjerg, B.

Dan AEC Res. Establ. Riso Rep. (200), 1-150; 1972

SULFUR; UPTAKE; ANIMALS; NUTRITION; SELENATES; SELENITE; OXIDATION; SELENIUM; PLANTS; SOILS

82
The Zinc Status of some Nova-Scotia Soils and Crops

Bishop, R.F.; Eachern, C.R.

Commun. Soil. Sci. Plant Anal 4 (1), 1973, 41-50

ZEA-MAYS; AVAILABILITY; SOILS; CROPS; ZINC

83
Various Qualitative Aspects of the Effect of Soil Organic Matter on the Behavior of Artifical Isotopes in Soils

Bittel, R.; Lehr, J.

Part of Isotopes and Radiation in Soil Organic Matter Studies. Proc. Symp. IAEA & FAO, Vienna, 1968, (497-513) (French); 1969

SOILS; ORGANIC MATTER; RADIOISOTOPES

84
Absorption of Arsenate Ions by Chlorella Partial Reduction of Arsenate to Arsenite

Blasco, F.; Gaudin, C.; Jeanjean, R.

C.R. Hebd. Seances Acad. Sci. Ser. Sci. Nat. (Paris), 273 (9), 1971, 812-815

AUTORADIOGRAPHY; CENTRIFUGATION; ABSORPTION; ARSENATE; REDUCTION; ARSENITE

85
Mercury-Complex Intergrades in Smectite

Blatter, C.L.; Dept. Geology, State University of New York, Binghampton, NY

Clays Clay Miner. (CCMPA7), 21(4), 261-3; 1973

MERCURY; SMECTITE; SOILS; MONTMORILLONITE

86
Relationships Between Trace Element Contents and Other Soil Variables in some Papua New-Guinea Soils as Shown by Regression Analyses

Bleeker, P.; Austin, M.P.

Aust. J. Soil Res., 8 (2), 1970, 133-143

COPPER; ZINC; NICKEL; COBALT; MANGANESE; WATER; SAND; TRACE ELEMENTS; SOILS

87

The Mobilization of Trace Elements by Aerobically Decomposing Plant Material Under Simulated Soil Conditions.

Bloomfield, C.; Kelso, W.L.; Piotrowska, M.; Rothamsted Exp. Stn., Harpenden, England

Chemy, Ind., 59-61; 1971

SOILS; OXIDES; IRON; MANGANESE; ZINC; COBALT; NICKEL; LEAD; COPPER; AEROBIC; DECOMPOSITION; HUMUS; MOBILIZATION

The rates were measured at which the oxides of Fe, Mn, Zn, Co, Ni, Pb and Cu are dissolved by aerobically decomposing plant matter. Fe and Mn were relatively inactive, but considerable amounts of the other elements were mobilized. The first month of incubation was the period of most active mobilization. The amount of dissolved Cu decreased sharply during the second month's incubation, while the Cu content of the insoluble organic residue increased correspondingly. The capacity of the soluble organic decomposition products to dissolve the various oxides under sterile conditions decreased as rotting proceeded, except with Cu, with which the activity of the extracts increased at first and then decreased rapidly. The activity became almost negligible long before recognizable humose matter was formed. Significant amounts of the metals are fixed by the insoluble organic residues.

88

Modelling the Movement of Chemicals in Soils in Water

Boast, C.W.

Soil Sci., 115, (3), 224-230; 1973

ADSORPTION; BIBLIOGRAPHY; MODEL; REVIEW; SOILS; WATER; LANDFILL STORAGE; CONSUMPTION

89

Migration of Strontium 90 and Cerium 144 in Soils of Different Texture

Bochkarev, V.M.; Antropova, Z.G.; Belova, T.T.

Soviet Soil Sci. 9, 936-938; 1964

MIGRATION; STRONTIUM 90; CERIUM 144; SOILS; STRONTIUM; CERIUM; RADIONUCLIDES

90

Sorption of Amino-Acids by Copper Montmorillonite

Bodenheimer, W.; Heller, L.

Clay Miner, 7, 167-176; 1967

SORPTION; GLUTAMIC ACID; GLYCINE; METHIONINE; LYSINE; AMPHOTERIC; CLAY; COPPER

Sorption of glutamic acid, glycine, methionine and lysine by copper-montmorillonite (prepared by shaking 200g bentonite with 600ml of N Cu(NO32 solution, centrifuging and drying at 100 degrees C) was studied. The presence of copper enhanced the sorption of amphoteric and basic amino-acids by clay, leading to stable amino acid-copper-clay associations.

91

Soil Absorption of Air Pollutants

Bohn, H.L.; Dept. of Soils and Water Engineering, University of Arizona, Tucson, Arizona 85721

J. Environ. Quality, 1(4), 372-377; 1972

NITROGEN; OXYGEN; PHOSPHATE; SULFUR; REVIEW; HYDROGEN FLORIDE; FLUORINE; GASES; PHOSPHORUS; HYDROGEN CHLORIDES; SULFURIC ACID; PHOSPHORIC ACID; NITRIC ACID; SOILS; ABSORPTION; NICKEL; CADMIUM; LEAD; ARSENIC; COPPER; BERYLLIUM; ZINC; MERCURY; SULFUR DIOXIDE; CARBON MONOXIDE; NITROGEN OXIDE; CHLORINE; OZONE; PEROXYACETYL NITRATE; HYDROGEN SULFIDE; MERCAPTANS; ALDEHYDES; HYDROCARBON

The mechanism and rates of the absorption of various air pollutants by soil are reviewed with respect to particulate air pollutants, including nickel, cadmium, lead, arsenic, copper, beryllium, zinc, and mercury; and gaseous air pollutants, including sulfur dioxide, carbon monoxide, nitrogen oxides, oxidants (chlorine, ozone, and peroxyacetyl nitrate), hydrogen sulfide, mercaptans, aldehydes, hydrocarbons, fluorine compounds, phosphorus compounds, and acidic gases and mists (hydrogen chloride, sulfuric acid, phosphoric acid, nitric acid, and hydrogen fluoride). Soils absorb organic increasing number of nitrogen, phosphate, oxygen, and sulfur groups in the compound. The absorption of lower molecular weight and gases faster and in greater amounts with increasing molecular weight and increasing number of nitrogen, phosphate, oxygen, and sulfur groups in the compound. The absorption of lower molecular weight and less-substituted organic gases depends on the buildup of an appropriate microbial population. The absorption of inorganic air pollutants is primarily by chemical and physical means and involves oxidation and other chemical reactions. (79 references)

92

Fixation of Arsenates by the Soil

Boischot, P.; Hebert, J.

Ann. Agron., 18, 426-448; 1948

ARSENATE; CLAY; PH; FIXATION; CALCAREOUS SOILS; ADSORPTION; SOILS

The fixation of arsenic trioxide by clay depends on the amount of arsenic introduced into the soil, the duration of the contact, the quality and nature of the ions combined with the clay and the pH. In an acid medium fixation is much slower than in a neutral or alkaline medium. Fixation by clacareous soils is by adsorption, not by combination. Humus fixes only a small proportion of arsenic trioxide in a neutral or alkaline medium. The fixation is proportional to the quantity of humate.

93

Bacterial Dehalogenation of Chlorinated Aliphatic Acid

Bollag, J.M.; Alexander, M.; Penn. State University, University Park, PA

Soil Biol. Biochem., 3, 91-96; 1971

ENZYMES; SOILS; DEHALOGENATION; CHLORINATED ALIPHATIC ACID; CHLORINE; ALKANOIC ACID

An enzyme extract produced by a strain of MICROCOCCUS DENITRIFICANS isolated from soil and grown on 3-chloropropionic or 3-chlorobutyric acid was capable of removing the Cl present in a number of 3- and 4-C alkanoic acids if the halogen was in the beta-position but not if it was in the alpha-position. There was no evidence of 3-hydroxypropionic acid serving as an intermediate in the metabolism of beta-chloropropionic acid.

94

Bacterial Dehalogenation of Chlorinated Aliphatic Acids

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ENZYMES; SOILS; DEHALOGENATION; CHLORINATED ALIPHATIC ACID; CHLORINE; ALKANOIC ACID

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95

Geochemical and Vegetation Studies of Trace Substances from Lead Smelting

Bolter, E.; Hemphill, D.D.; Wixson, B.; Butherus, D.; Chen, R.; University of Missouri, Rolla and Columbia, MO

Part of Hemphill, D.D. (Ed.), Sixth Annual Conference on Trace Substances in Environmental Health, Held at Memorial Union, University of Missouri-Columbia, Columbia, MO, June 13-15, 1972

SOILS; PLANTS; LEAD; ZINC; COPPER; CADMIUM; MANGANESE; SULFUR; SMELTERS; LEAVES; AIR; GALENA; SPHALERITE; TREES; X-RAY FLUORESCENCE ANALYSIS; ATOMIC ABSORPTION SPECTROPHOTOMETRY; DEPTH VARIATIONS; ROOTS; TRANSLOCATION; FOLIAR APPLICATION; GEOGRAPHIC VARIATIONS; HUMUS

Several hundred soil and vegetation samples from the "Viburnum Trend" or "New Lead Belt" of Southeast Missouri were analyzed for lead, zinc, copper, cadmium, manganese and total sulfur to determine natural background concentrations and to delineate areas of anomalous high concentrations caused by the mining and lead smelting activity. The area around one lead smelter showed anomalous high heavy metal concentrations for a distrance of several miles. Other activities, such as the transport of ore concentrate in open trucks or by railroad, also act as sources of pollution. Elevated heavy metal concentrations in soils were found to be mainly restricted to the humus layer on the surface of the soil and to the top one inch soil layer. Most of the lead found in vegetation samples was thought to be present on the surface of the leaves. Findings should be of technical value for pollution abatement applications.

96

Dissolution of Galena in the Presence of Fulvic Acid

Bondarenko, G.P.

Geokhimiya, 5, 631-636; 1968

DISSOLUTION; GALENA; PH; FULVIC ACID; PRECIPITATION; GEOCHEMICAL MIGRATION; LEAD

Analysis after 60-120 days of galena/fulvic acid systems adjusted to initial pH values of 2.05-10.6 showed that small amounts of lead had entered solution at all pH values. Fulvic acid (extracted from the humus horizon of a soddy-podzolic soil) inhibited precipitation of lead from solutions; geochemical migration of lead may occur as a lead-fulvic acid complex.

97

Stability of Soluble Coordination Compounds of Copper with Humic and Fulvic Acids

Bondarenko, G.P.

Geochemistry Int.,9(4), 702-711; 1972

COPPER; FULVIC ACID; HUMIC ACIDS

98

Investigations on the Metal Binding Ability of Soil and Microbial Humic Acid Using Cadmium, Copper, and Lead Ion Electrodes

Bondietti, E.A.; Sweeton, F.H.

Agronomy Abstracts 1973, Annual Meetings American Society Agronomy, Las Vegas, Nev., p. 89; 1973

METAL BINDING; HUMIC ACIDS; CADMIUM; COPPER; LEAD; SOILS

99

The Underground Migration of Radionuclides Produced in Soil Near High Energy Proton Accelerators

Borak, T.B.; Awschalom, M.; Fairman, W.; Iwami, F.; Sedlet, J.

Health Phys. 23(5), 679-687; 1972

RADIONULIDES; PROTON ACCELERATORS; GROUND WATER; MINERALS; TRANSPORT; SOILS; IRON 55; IRON 59; COBALT 60; SCANDIUM 46; VANADIUM 48; CHROMIUM 51; MANGANESE 54; TRITIUM; BERYLLIUM 7; SODIUM 22; CALCIUM 45

100
The Fate of Polycyclic Aromatic Hydrocarbons in Experiments Using Sewage Sludge Garbage Composts as Fertilizers

Borneff, J.; Farkasdi, G.; Glathe, H.; Kunte, H.; Inst. Landwirtschaft Mikrobiol., Univ. Giessen

Zbl. Bakt. Reihe B, 157/2-3 (151-164); 1973

PAH; SOILS; AROMATIC HYDROCARBONS; HYDROCARBONS; SEWAGE SLUDGE; GARBAGE COMPOST; POLYCYCLIC; FERTILIZERS; MANURE; MINERAL FERTILIZER; CROPS; REDUCTION; PLANTS; ROOTS

The influence of different fertilizers (sewage sludge/garbage compost, manure, mineral fertilizer) on the concentration of polycyclic/aromatic hydrocarbons (PAH) in soil and crops was investigated in field experiments and in pots. The fertilizers were applied in quantities used in agricultural practice, that is, 80 to 100 tons of compost, or 30 tons of manure, or 150 kg, Nitrophos per hektare (approximately 2.5 acres). Relatively high concentrations of PAH were found in all organic fertilizers, including manure, although the different samples varied considerably in their content, with manure up to the factor 10. The compost treated soils showed a marked increase of PAH according to the high content of the composts. In the soil treated with manure the increase was less, but it must be considered, that calculated as dry substance the quantity of manure applied had been only 1/10 of the compost. In the couse of the experiments concentrations of PAH in the soil varied; in some cases increasing and in others decreasing. It seems probable that microbial synthesis and reduction processes are involved. Regarding the plants, which were cultivated on these soils, the PAH content appeared to be related to the content in the soil only in the roots, and of these only in the outer layer. In one single case an increase in concentration was found in the inner portion of the root. The proportion of edible plants which might possibly be affected (for example, radish, carrot) is, however, very small. As nearly all plant products ingested with edible roots which were grown soils treated with sewage sludge garbage compost does not enhance the health hazard to man. Nevertheless further monitoring studies are considered desirable.

101
Cancer Due to Benzpyrene in Natural Soils

Bornett, J.; Kunte, H.; Farkasdi, G.; Glathe, H.; Hygiene Institute, University of Mainz, Mainz, Germany

UMSCHAU(UMSCAS), 73(20), 626-628; 1973

BENZOPYRENE; PLANTS; SOILS; COMPOST; CANCER

102
Chelating Effort of Organic Matter and Its Influence on the Migration of Fission Products in Soils

Bovard, P.; Granby, A.; Saas, A.

Part of Isotopes and Radiation in Soil Organic Matter Studies. Proc. Symp. IAEA & FAO, Vienna, 1968, (471-495); 1969

CHELATES; ORGANIC MATTER; SOILS; MIGRATION; FISSION PRODUCTS

103
Trace Elements in Biochemistry

Bowen, H.J.M.

Academic Press, London, 241p.; 1966

UPTAKE; EXCRETION; ORGANISMS; DEFICIENCY; FUNCTIONS; TRACE ELEMENTS; BIOGEOCHEMISTRY; SOILS

Includes chapter 3, composition of soil; 5, elementary composition of organisms and their parts; 6, uptake and excretion of elements by organisms; 7, essentiality, deficiency, toxicity of elements; 8, functions of essential elements; 12, summary of available data on biogeochemistry of trace elements

104
Trace Elements in Biochemistry

Bowen, H.J.M.; Department of Chemistry, The University, Reading, England

Academic Press, New York and London, 241 p.; 1966

SOIL COMPOSITION; ELEMENT CYCLES; TRACE ELENTNS; BIOLOGICAL FRACTIONATION; ISOTOPES; NATURAL RADIOACTIVITY; AIR; WATER; PLANTS; ANIMALS; REVIEW; METALS; SOILS; CYCLES

A comprehensive summary of the data of inorganic biochemistry. It begins with a brief review of the origin of the elements and their occurrence in rocks, soils, the ocean and the atmosphere. The elementary composition of plants and animals is discussed next, together with quantitative data on elementary cycles involving living organisms. Other chapters are concerned with the uptake and excretion of elements, their essentiality and toxicity, and the occurrence of essential elements in enzymes and other molecules of biochemical interest. There are chapters on the natural radioactivity of organisms, and on the contamination of the environment by both radioactive and non-radioactive elements. A special feature is the final chapter which summarizes the data available for the occurrence and behaviour of 90 elements in the Biosphere.

105
Nutrient and Radionuclide Cycling

Brady, D.

(UCLA--12-919, PP 43-51) 1973; 1973

RADIONUCLIDES; CYCLING; NUTRIENTS; NUTRIENT CYCLING; RADIONUCLIDE CYCLING

106
Vertical Distribution of Fission Elements in Some Types of Soils in the USSR

Brandakov, V.F.; Dibbaeva, A.V.; Svishchava, V.I.; Churkin, V.N.

Atomic Energy (USSR) 25, 331-32; 1968

DISTRIBUTION; FISSION PRODUCTS; SOILS; VERTICAL DISTRIBUTION

107
Land Reclamation and River Pollution Problems in the Croal Valley Caused by Waste from Chromate Manufacture

Breeze, V.G.

J. Appl. Ecol., 10(2), 513-525; 1973, August

CHEMICAL ANALYSIS; CHEMICAL INDUSTRIES; ALLIED INDUSTRIES; CROPS; PLANTS; CHROMIUM; CHEMICAL WASTE; INDUSTRIAL WASTES; RIVERS; ESTUARIES; IONS; CHROMATE; SOILS; RECLAMATION

Soil layers over chromate tips are only successful if deep. Chromic ions are less toxic than chromate ions, owing to compound formation, suggesting reclamation by chemical reduction of the chromate.

108
Metallo-organic Complexes in Soil

Bremner, M.

Nature (London) 158, 790-91; 1946

ORGANOMETALLICS; SOILS; COMPLEXES

109
Alkaline and Alkaline Earth Metal Equilibrium in the Soil, Associated with Coffee Plant Response to Potassium

Briceno, J.A.; Carvajal, J.F.; Fac. Agron., Univ. Costa Rica, San Jose, Costa Rica

TURRIALBA (TURRAB), 23(1), 56-71; 1973

METALS; EQUILIBRIUM; SOILS; COFFEE; POTASSIUM; CALCIUM; MAGNESIUM; EARTH METALS; SOILS; PLANTS

110
Soil Organic Matter-Metal Complexes. 2. Cation-Exchange Chromatography of Copper and Calcium Complexes

Broadbent, F.E.

Soil Sci., 84, 127-131; 1957

CHROMATOGRAPHY; COPPER; CALCIUM; ORGANIC MATTER; LEACHING; CARBOXYL RETENTION; SOILS; CATION EXCHANGE

Soil organic matter in the acid form was covered with a thin layer of a similar sample saturated with Cu+2 or calcium. Curves describing the relationship between the volume of effluent obtained by leaching with HCl and the copper and calcium concentrations of the effluent are given. Four maxima occur with copper and two with calcium. The broad initial maximum common to all the chromatograms is due to carboxyl retention.

111
Soil Organic Matter-Metal Complexes 1. Factors Affecting Retention of Various Cations

Broadbent, F.E.; Ott, J.B.

Soil Sci., 83, 419-427; 1957

RETENTION; ORGANIC MATTER; LOAM; MEADOW SOIL; PEAT; CHELATES; PH; COPPER; IRON; MANGANESE; FULVIC ACID; SOILS; LEACHING; CALCIUM; MAGNESIUM; BARIUM; CATION EXCHANGE; MEADOWS

Organic matter samples were prepared by treating the fine fraction of a gravelly loam, meadow soil and subsoil of peat with HCl-HF. The fulvic fraction, obtained by extracting the sample with alkali in a nitrogen atmosphere and precipitating the humic acid with HCl, was mixed with an equal volume of dilute CuSO4 and the spectral distribution curves and optical densities at 360 and 650 microns were determined by spectrophotometry. The results produced evidence of chelate formation by the soluble fraction of soil organic matter. When small samples of organic matter were leached with dilute solutions of acetate of Cu+2, Fe+2 and Mn+2 (in this decreasing order of retention) of FeCl3 in increasing concentrations of 5 x 10(-4) M and more, the amount of complex formed varied with the concetration of the cation and the pH of the solution. Complex formation was rapid and cations retained after contact for one hour only slightly exceeed those retained after 5 minutes. When the organic preparations were saturated with various cations, equilibrated with an equivalent amount of HCl and the quantity of displaced cations determined, retention values showed the order: copper greater than barium equals calcium greater than or equal to magnesium. Symmetry values showed the copper complex to be the most stable for the preparations from mineral soil and the barium complex the most stable for the peat-soil complexes.

112
Molybdenum and Copper in Irish Pasture Soils

Brogan, J.C.; Fleming, G.A.; Byrne, J.E.

Ir. J. Agric. Res. 12 (1), 1973, 71-81

MOLYBDENUM; COPPER; SOILS; PASTURES

113
Soil Sterilization and Minor Element Mobilization

Bronsart, H.

Bull. German Plant Protection Service 1, 115-116 (G); 1947

TRACE ELEMENTS; SOILS; MOBILIZATION; SOIL STERILIZATION

114
Zinc Relationships in Aiken Clay Loam

Brown, A.L.

Soil Sci. 69, 349-358; 1950

ZINC; CLAY; LOAM; SOILS

115
Effect of Liming on the Availability of Zinc and Copper

Brown, A.L.; Jurinak, J.J.

Soil Sci., 98, 170-173; 1964

LIMING; ZINC; COPPER

116
Zinc-Phosphorous Interactions as Measured by Plant Response and Soil Analysis

Brown, A.L.; Kroutz, B.A.; Eddings, J.L.

Soil Sci. 110(6), 415-420; 1970

ZINC; PHOSPHORUS; PLANTS; SOILS

117
Leaching of Added Selenium From Alkaline Soils as Influenced by Sulfate

Brown, M.J.; Carter, D.L.

Soil Science Society of America Proc., 33, 563-565; 1969

LEACHING; SELENIUM; ALKALINE SOILS; SULFATES; SOILS

118
Contamination of Soil and Vegetation Near a Zinc Smelter by Zinc, Cadmium, Copper, and Lead

Buchauer, M.J.; Institute of Microbiology, Rutgers State University, New Brunswick, NJ

Environmental Science and Technology (ESTHAG) 7(2), 131-5; 1973

ZINC SMELTER; VEGETATION; CONTAMINATION; SOILS; CADMIUM; COPPER; LEAD; ZINC

119
Solubility Products and Entropies of Sulfides, Selinides and Tellurides

Buketov, E.A.; Ugorets, M.Z.; Pashinkin, A.S

Russ. Journ. Inorg. Chem.   9, 272-294; 1964

SULFIDE; SELINIDES; TELLURIDES; SOLUBILITY PRODUCTS; ENTROPIES

120
Dissolution of Sparingly Soluble Salts by Soil Organic Matter

Bunzl, K.; Sansoni, B.; Inst. Strahlenschutz, Ges. Strahlen- Und Umweltforsch. M.B.H. Muenchen, Neuherberg/Munich, Ger.

Z. Pflanzenernaehr. Bodenk.(ZPBOAL) 1972, 133(1-2), 132-43; 1972

SOILS; ORGANIC MATTER; SALTS; DISSOLUTION; PEAT; HUMIC ACIDS; STRONTIUM; SULFATES; HUMATE; LEAD; BARIUM

121
Asbestos Content of the Soil and Endemic Pleural Asbestosis

Burilkov, T.; Michailova, L.

Environ. Res., 3(5-6), 1970, 443-451

HUMANS; ASBESTOS; SOILS

122
Sepiolite Content of the Soil in Regions with Endemic Pleural Calcifications

Burilkov, T.; Michailova, L.

Int. Arch. Arbeitsmed., 29(2), 1972, 95-101

HUMANS; SILICATES; ASBESTOS; ANTHOPHYLLITE; TREMOLITE; EPIDEMIOLOGY; SOILS

123
Distribution of Heavy Metals in the Vicinity of an Industrial Complex

Burkitt, A.; Lester, P.; Nickless, G.

Nature (London) 238, 327-328; 1972

DISTRIBUTION; HEAVY METALS; INDUSTRY

124
RADIONUCLIDE CYCLING IN TERRESTRIAL ENVIRONMENTS.

Carfagno, D.; Westendorf, W.

(ORNL--4848, PP 1-8) FEB 1973.; FEB 1973.

RADIONUCLIDE CYCLING; CYCLING; RADIONUCLIDES; TERRESTRIAL ECOSYSTEM

125
Effects of Soil Applied Herbicides and Calcium on Mineral Composition of Pea-D Pisum-Sativum-D

Carolus, R.L.; Putnam, A.R.; Ruiz, M.R.

Hortscience, 6(3 Sec. 2), 1971, 278

SIMAZINE; DINOSEB; DICHLOBENIL; TRIFLURALIN; NITROGEN; POTASSIUM; MAGNESIUM; SODIUM; IRON; MANGANESE; COPPER; ZINC; PERMEABILITY; ENZYMES; ACTIVE TRANSPORT; PEAS

126
Seasonal Abundance of Certain Soil Arthropods in a Fenitrothion-Treated Red Spruce Stand

Carter, N.E.; Brown, N.R.; Fac. For., Univ. N.B., Fredericton, N.B., Canada

Can. Entomol., 105(8), 1065-1073; 1973

FAUNA; RED SPRUCE; FENITROTHION; CENTIPEDES; SPIDERS; ARTHROPODS; SOIL FAUNA; INSECT; SOILS

Certain arthropod predator elements of the soil fauna of a mature red spruce PICEA RUBENS SARG. stand were studied. It presents differences between abundance 2 year prior to and 1 year after aerial spraying with fenitrothion at 2 and 3 ounces per acre. One species of centipede ESCARYUS sp., PSEUDOSCORPION MICROBISIUM sp., and 2 species of harvestmen LEIOBUNUM CALCAR and L. BICOLOR were noted in fewer numbers during the year of spraying. Higher numbers occurred the following year. Spiders of the family ERIGONIDAE showed no marked difference in numbers during the course of the study. Most other spiders were encountered in reduced numbers during the spray year but rebounded next year. Apparently, fenitrothion does cause temporary reduced abundance of at least some predacious arthropod components of the soil fauna. The effect of such changes in the insect community on soil processes remains unknown; even more so, the influence of repeated annual applications of fenitrothion remains undetermined.

127
Zinc

Carter, R.L.; Coastal Plain Expt. Sta., Tifton, Georgia

Georgia Agr. Expt. Sta., Bull. 126, 52-78; 1964

PHOSPHATES; ORGANIC MATTER; GEOCHEMISTRY; ZINC; SOILS; PH; ZINC DEFICIENCY; MANURE; COLLOIDS; PLANTS; CROPS; CHLOROPHYLL; LEAVES; CLAYS

The total content of zinc in soils is generally low in comparison with other essential elements. The soils contain on the average 10 to 300 parts per million of total zinc and less than 1 part per million of exchangeable zinc. The availability of zinc to plants was examined under variable environmental soil conditions. Its availability is affected by various factors: (a) it decreases as the pH of the soil rises, the critical point being between 5.5-6.5; (b) zinc deficiency frequently occurs in soils abnormally high in soluble and total phosphate and in soils rich in organic matter (for example, farm manure); (c) colloidal clays have a definite absorption capacity for zinc. Zinc is an essential element for normal growth of many plants and crops. Its deficiency is characterized by a retardation of normal growth and lack of chlorophyll in the leaves. The deficiency can be corrected by incorporation of zinc salt in the soil. However, the response of crops to zinc application depends on soil type, being positive on certain soils and insignificant on others. CA, 63 12262(1965)

128
Effect of Fertilizer Anions on the Solubility of Native and Applied Selenium in Soil

Cary, E.E.; Gissel-Nielsen, G.

Soil Sci. Soc. Am. Proc., 37(4), 1973, 590-593

NITRATE; PHOSPHATES; SULFATES; INTERACTIONS; FERTILIZERS; SOLUBILITY; SELENIUM; ANIONS

129
Reactions of Selenate-Selenium Added to Soils that Produce Low-Selenium Forages

Cary, E.E.; Wieczorik, G.A.; Allaway, W.H.

Soil Sci. Soc. Amer. Proc., 31, 21-26; 1967

SELENATES; SELENIUM; SOILS; FORAGE

130
Biodehalogenation. Reductive Dehalogenation of the Biocides Ethylene Dibromide, 1,2-Dibromo-3-Chloropropane, and 2,3-Dibromobutane in Soil

Castro, C.E.; Belser, N.O.; Department of Nematology, University of California, Riverside, CA 92502

Environmental Science and Technology, 2(10), 779-83; 1968, October

DIBROMIDES:ETHYLENE DIBROMIDE; 1,2-DIBROMO-3-CHLOROPORPANE; 2,3-DIBROMOBUTANES; BIOCIDES; ETHYLENE; N-PROPANOL; BUTENES; SOILS; WATER; BIODEHALOGENATION; DEHALOGENATION

Soil-water cultures reductively dehalogenate the vicinal dibromides: ethylene dibromide, 1,2-dibromo-3-chloroporpane, and the 2,3-dibromobutanes. The products of the conversion of these widely employed soil biocides, ethylene, n-propanol, and butenes, respectively, and the scope, nature, and speed of the processes have been outlined.

131
Organic Sequestering Agents

Chaberek, S.; Martell, A.E.

John Wiley & Sons, New York; 1959

ORGANICS; SEQUESTERING AGENTS

132
Translocation of BHC from Soil to Andropogon Sorghum (JOWAR) and its Influence on the Uptake of Nutrients

Chawala, R.P.; Chopra, S.L.

J. Res. Punjab Agric. Univ. 6, 952-958; 1969

TRANSLOCATION; BHC; SOILS; UPTAKE; SORGHUM; ANDROPOGON; CROPS; PHOSPHORUS; POTASSIUM; PLANTS; PH; ELECTRICAL CONDUCTIVITY; CARBON

BHC was translocated into the crop. K and P uptake by the plants was affected by 10% BHC dust. BHC did not affect the pH, electrical conductivity, organic C, cation-exchange capacity or available nutrients of the soil.

133
Lead, Arsenic and Copper Content of Crops Grown on Lead Arsenate-Treated and Untreated Soils

Chisholm, D.

Can. J. Plant Sci., 52(4), 583-588; 1972

LEAD; ARSENIC; COPPER; CROPS; ABSORPTION; RESIDUES; PLANTS

Increased lead and arsenic concentrations in the surface soil (0-15 cm), resulting from applications of lead arsenate (PBHASO4), increased both lead and arsenic levels in crops grown on treated plots. The lead levels in some crops approached or exceeded the Canadian residue tolerance of 2.0 ppm. PBHASO4 soil treatments did not affect copper absorption by crops. On areas such as old orchard land contaminated with PBHASO4 residues it may be advisable to ascertain the soil lead status before planting certain crops, and also to determine the lead affinity and arsenic sensitivity of the plants to be grown.

134
Persistence and Effects of some Pesticides in Soil

Chisholm, D.; MacPhee, A.W.; Research Station, Canada Dept. of Agriculture, Kentville, Nova Scotia, Canada

J. Econ. Entomol., 65(4), 1972, 1010-1013; 1972

BEANS; FAUNA; DDT; BHC; ARSENIC; CHLORDANE; SULFUR; FERBAM; PARATHION; CROPS; NITROGEN; SANDY LOAM; LOAM; COLLEMBOLAN; PESTICIDE; PERSISTENCE

DDT significantly decreased the yield of beans in a sandy loam 16 years after application. More than 50% of applied DDT and arsenic remained in the soil for 15 and 16 years, respectively. Traces of parathion were detected 10 years after application. Arsenic and DDT significantly decreased the N content of bean leaves. The collembolan population was higher in DDT-treated plots than on check plots 6 years after application.

135
Adsorption and Leaching of Parathion O-C,Di-Ethyl-O-P-Nitrophenyl Phosphorothioate on Soils and Effect of Various Physical Factors on Adsorption

Chopra, S.L.; Das, M.; Das, B.; Punjab Agricultural University, Ludhiana, Punjab, India

J. Indian Soc. Soil Sci., 18(4), 1970, 437-446; 1970

SOILS; ADSORPTION; LEACHING; PARATHION; PH; CATIONS; HYDROGEN; CALCIUM; SODIUM; POTASSIUM; MAGNESIUM; MOBILITY

The adsorption of parathion increased with increase in concentration, rise in activation temperature, lowering of pH and increase in organic matter content. Adsorption by homoionic soils was directly related to the percentage saturation by various cations with adsorption decreasing in the order: H+ greater than Ca2+ greater than Mg2+ greater than K+ greater than Na+. Parathion mobility, and therefore leaching, was greater in light than heavy soils.

136
Separated Power Station Light Ashes with the Content of Arsenic Compounds in the System Soil Plant

Chrenekova, E.; Holobrady, K.

Pol'Nohospodarstvo 16(1), 1970, 34-44

POWER PLANTS; ASH; ARSENIC; SOILS; PLANTS

137
Zinc Diffusion and Distribution Coefficients in Soil as Affected by Soil Texture, Zinc Concentration and pH

Clark, A.L.; Graham, E.R.

Soil Sci. 105, 409-418; 1968

ZINC; PH; CONCENTRATION; SOILS; DIFFUSION; DISTRIBUTION COEFFICIENTS

138
Cadmium in the Environment - An Annotated Bibliography

Copenhaver, E.D.; Ulrikson, G.U.; Newman, L.T.; Fulkerson, W.

Oak Ridge, National Laboratory, ORNL - EIS-73-17, 451 p.

CADMIUM; TRANSPORT; BIBLIOGRAPHY

139
Soil Contamination by Airborne Metallic Dust Particles and its Effect on Plants in the Sudbury Basin Ontario

Costescu, L.M.; Hutchinson, T.C.

Am. J. Bot., 58 (5 part 2), 481; 1971

CABBAGES; TOMATOES; RADISHES; LETTUCE; AIR; BIOASSAY; NICKEL; COPPER; COBALT; IRON; SOILS; PH; DUSTS; PLANTS

140
The Ecological Consequences of Soil Pollution by Metallic Dust from the Sudbury Smelters

Costescu, L.M.; Hutchinson, T.C.; Dept. of Botany and Institute of Environmental Sciences and Engineering, University of Toronto, Toronto, Ontario, Canada

Part of proceedings of the 18th meeting, Environmental Progress in Science and Education, 540-545; 1972

SMELTERS; DUSTS; AIR; COPPER; NICKEL; IRON; COBALT; SILVER; PLATINUM; GOLD; SULFUR; SELENIUM; INDUSTRIAL EMISSIONS; SULFUR DIOXIDE; TREES; LEAD; ARSENIC; SOILS; ATOMIC ABSORPTION SPECTROPHOTOMETRY; LEAVES; RAINFALL; PH; CONDUCTIVITY; STACK EMISSIONS; PARTICULATES; ZINC; MANGANESE; DUSTFALL; ROOT GROWTH; SEED GERMINATION; ALUMINUM; NITRATE; SULFATES; LETTUCE; TOMATOES; INDUSTRY; DUSTS

While Sudbury has had a severe air pollution problem with SO2, the contamination of the area by metallic dust has been overlooked. Extensive soil contamination has occurred over a wide area. Soil levels of such pollutants as nickel and copper have, both in theory and in practice, been found to be toxic to test species. The soil contamination has a pattern indicative of an airborne smelter source. The metallic pollution is a continuing phenomenon. Elevated levels of nickel can be detected up to 31 miles from the smelter, toxic water soluble nickel levels to 10 miles. The patterns of metal pollution are reflected in the excessive levels of the smelted metals in resistant vegetation close to the smelter. Heavy metals are persistent in soils - the ecological consequences to date are perhaps only masked by the SO2 damage.

141
Effect of Soil Enrichment with Mineral Elements and Fertilizers on Surface Water and Plants

Cottenie, A.; Faculty Agronomy Sciences, Ghent, Belgium

Qual. Plant. Mater. Veg., 22(1), 37-53; 1972

PLANTS; PH; SOIL MOISTURE; SOIL ENRICHMENT; TRACE ELEMENTS; FERTILIZERS; LIMING; PLANTS; SOILS

Observations indicate that intensive use of solid fertilizers may result in a certain accumulation of nutrient elements in the soil and an enrichment of soil water with these elements. This type of contamination, however, is less important than soil and plant pollution with external sources of trace elements, which can lead to toxic accumulations in plants and yield depressions. An accurate identification of such situation is possible using simple pot experiement techniques. The most effective way for immobilizing an excess of unwanted trace elements in light textured soils, is a consistant increase of soil pH by liming.

142
Exchange of Zinc, Manganese, Copper, and Iron in Relation to Saturation of the Soil Complex

Cottenie, A.; Kiekens, L.; Fac. Agric. Sci., State Univ. Gent, Ghent, Belgium

Potassium Soil, Proc. Colloq. Int. Potash Inst., 9th(26VFAO) 1972, 113-23; 1972

TRACE ELEMENTS; SOILS; MACRONUTRIENTS; SORPTION

143
Polyphenols in Plant, Humus, and Soil. 2. Reduction and Transport by Polyphenols of Iron in Model Soil Columns

Coulson, C.B.; Davies, R.I.; Lewis, D.A.

J. Soil Sci. 11, 30-44; 1960

IRON; POLYPHENOL; PHENOLS; PLANTS; HUMUS; SOILS; REDUCTION; TRANSPORT; SOIL COLUMN; MODELS; MODEL SOIL COLUMNS

144
Polyphenols in Plant, Humus, and Soil. I. Polyphenols of Leaves, Litter, and Superficial Humus from Mull and Morsites

Coulson, C.B.; Davies, R.I.; Lewis, D.A.

J. Soil Sci., 11, 20-29; 1960

POLYPHENOL; PLANTS; HUMUS; SOILS; LEAVES; LITTER; PHENOLS

145
Determination of the Stability Constants of Metallo-Organic Complexes in Soils

Courpron, C.

Annls. Agron. 18, 623-638; 1967

STABILITY CONSTANTS; HUMIC ACIDS; SOILS; COPPER; ZINC; FULVIC ACID; ORGANIC MATTER; ORGANOMETALLICS; HEATH ECOSYSTEM; RETENTION

Spectrophotometric and ion-exchange techniques were used to determine the stability constants of complexes formed between copper or zinc with fulvic or humic acid extracts from the A(o) horizon of a podzol characteristic of moist-heathland sandy soils. Results show higher stability constants for organic matter-copper than for organic matter-zinc complexes, suggesting that in humus-rich soils copper would be retained more strongly than zinc.

146
Effect of Phosphate and Other Anions on Trimethylarsine Formation by CANDIDA HUMICOLA

Cox, D.P.; Alexander, M.; Dep. Agron., Cornell Univ., Ithaca, N. Y.

Appl. Microbiol.(APMBAY) 1973, 25(3), 408-13; 1973

METHYLARSINE; PHOSPHATES; ARSENIC; METABOLITE; SOILS; MICROBES; PESTICIDES

147
Concentration of Heavy Metals in Soils With and Without Tilling

Croessmann, G.; Joseph Koenig Inst., Landwirtschaft. Unters. Forschungsanst. Landwirtschaftskammer Westfael. Lippe, Muenster/Westf., Germany

Staub - Reinhalt. Luft(STRHAV), 34(1), 22-23; 1974

METALS; SOILS; TILLAGE; ZINC; CADMIUM; CONCENTRATION; HEAVY METALS

148
Migration of Pollutants in a Glacial Outwash Environment

Crosby, J.W.; Johnstone, D.L.; Drake, C.H.; Fenton, R.L.

Water Resources Res., 4(5), 1095-1114; 1968, Oct.

BIOCONVERSION; SAMPLING; SEWAGE; SOILS; SUSPENDED SOLIDS; UNDERGROUND AQUIFERS; WASTES; WATER; PERMEABILITY; WASTE COMPOSITION; MIGRATION; GLACIAL OUTWASH; OUTWASH

Test drillings, neutron, gamma-gamma and natural gamma logging and chemical and bacteriological analysis show that 50 feet of soil removes bacteria, and lateral water movement is probably high.

149
The Utilization and Consumption of Mercury in France Outline of the Resulting Health Problems

Cumont, G.

Recl. Med. Vet. Ec. Alfort., 148(4), 1972, 427-442

AIR; WATER; SOILS; FOODS; UTILIZATION; CONSUMPTION; MERCURY

150
Cycling and Control of Metals

Curry, M.G.; Cigliotti, G.M.; National Environmental Research Center, Cincinnati, OH

Proceedings of Environmental Resources Conference, Columbus, OH, Oct. 31-Nov. 2, 1972. Environmental Protection Agency, Washington, DC, National Science Foundation, Washington, DC, Battelle Columbus Labs. Columbus, OH. Report No. NERC-C-CP-73-1; Monitoring Agency Report. No. 18; PB-216 184/2. 187p.

151
The Environmental Mercury Problem

D'Itri, F.M.

The Environmental Mercury Problem, The Chemical Rubber Co.; Cleveland, OH, 124 p.; 1972

MERCURY

152
The Biotransformation of Organomercury Compounds

Daniel, J.W.

Biochem. J. 130(2), 64P-65P; 1972

BIOTRANSFORMATION; ORGANOMERCURIALS; MICROORGANISMS; RATS; LIVER; FUNGICIDES; SOILS; MERCURY

153
Influence of Air Movement on Persistence of EPTC on Soil

Danielson, L.L.; Gentner, W.A.

Weeds, 12, 92-94; 1964

AIR MOVEMENT; PERSISTENCE; EPTC; AIR; SOILS

154
Trace Metal Content of Soils Affected by Base Metal Mining in the West of England

Davies, B.E.; Dept. of Geography, University College of Wales

Oikos (Copenhagen), 22, 366-72; 1971

TRACE ELEMENTS; SOILS; PASTURE SOILS; GARDEN SOILS; COBALT; IRON; MANGANESE; CADMIUM; COPPER; LEAD; SILVER; ZINC; MINES; MINE SPOILS; ATOMIC ABSORPTION SPECTROPHOTOMETRY; NICKEL; ASH; SEWAGE SLUDGE; MANURE; DISEASES; CANCER; MULTIPLE SCLERCSIS

The lower part of the Tamar Valley district of west Devon and east Cornwall is mineralized and there was extensive base metal mining in the nineteenth century. Soil samples were collected from pastures and gardens within and without the mineralized area. There was no regional differentiation for cobalt, iron and manganese. But within the mineralized area cadmium, copper, lead, silver and zinc contents of 41 per cent of pasture soils were abnormally high compared with the controls: this is ascribed to contamination by buried lodes and mine spoil. Most garden soils also contained anomalously high amounts of heavy metals but these may arise by processes other than mine pollution. Levels of acetic-soluble (that is, plant available) metals correlated significantly with the corresponding total contents. These results may be significant in relation to certain diseases.

155
Lead Contamination of Roadside Soil and Grass in Birmingham, England, in Relation to Natrrally Occurring Levels

Davies, B.E.; Holmes, P.L.; University College of Wales, Aberystwyth, United Kingdom

Journal of Agricultural Science, 79(3), 479-484; 1972

LEAD; SOILS; GRASSES; RUNOFF; ROADSIDE SOILS

156
Retention of Low Levels of Copper by Humic Acid

Davies, R.I.; Chreshire, M.V.; Graham-Bryce, I.J.

J. Soil Sci., 20, 65-71; 1969

COPPER; HUMIC ACIDS; RETENTION; SOILS

157
Chemical Nature of the Copper Complexes in Peat Soils and Plants

Dawson, J.E.; Nair, C.K.

Part of Copper Metabolism, W.O. McElroy and B. Glass, (Eds.), John Hopkins Press, Baltimore, Md. (JPH), (315-335); 1950

PEAT; SOILS; PLANTS; COPPER; COMPLEXES; CHEMISTRY

158
Horticulture and Pollution

Day, B.E.

Hort. Science 5(4), 237-239; 1970

SOILS; WATER; AIR; PESTICIDES; SALINITY; HORTICULTURE

159
Evolution of Soil Micro Flora as a Function of its Zinc and Lead Concentration

De Leval, J.; Demonty, J.

Rev. Ecol. Biol. Sol., 9(3), 491-504; 1972

SOILS; MICROFLORA; ZINC; LEAD; EVOLUTION

160
Evolution of the Soil Microflora as a Function of Zn and Pb Concentrations.

De Leval, J.; Demonty, J.; Universite de Liege Sart-Tilman, 4000-Liege, Belgium

Revue d'Ecologie et de Biologie du Sol., 9, 491-504; 1972

LEAD; ZINC; INDUSTRIAL EFFLUENTS; FALLOUT; VEGETATION; PLANTS; MICROBIOLOGY; MICROFLORA; MICROORGANISMS

On land where the original ARRHENATHERUM ELATIUS population had been gradually destroyed by industrial pollution (fall-out of Zn and Pb) and replaced by resistant AGROSTIS species, chemical and biological studies showed that vegetation affected microbiological activity more than did soil contamination by Zn and Pb. Reduced microbiological activity was observed in soil under dead A. ELATIUS, but an active microflora adapted to the new biotope had developed under AGROSTIS, showing the importance of the rhizosphere and the adaptability of the micro-organisms.

161
Toxicity and Movement of Heavy Metals in Serpentinic Soils (Northeastern Portugal)

De Sequeira, E.M.

Agronomie Lusit., 30, 115-154; 1968

HEAVY METALS; SERPENTINE SOILS; SOILS

162
Sorption and Desorption Characteristics of Malachite Green on Kaolinite

De, S.K.; Das Kanungo, J.L.; Chakravarti, S.K.; Dep. Chem., Univ. North Bengal, Darjeeling, India

J. Indian Soc. Soil Sci.(JINSA4) 1973, 21(2), 137-41; 1973

MALCHITE GREEN; DESORPTION; KAOLINITE; CATIONS; MALACHITE

163
Ultimate-Disposal of Waste-Water Concentrates to the Environment

Dean, R.B.

Environ. Sci. Technol., 2(12), 1079-1086; 1968, December

DISPOSAL; WASTEWATER; WATER; WASTES

164
Mobility of Trace Elements in Deltas (A Study of Pedogenesis Relevant to Availability Problems)

DeGroot, A.J.

Trans. Meet. Commns II & IV, Int. Soc. Soil Sci., 19, 267-279; 1967

DECOMPOSITION; RIVERS; TRACE ELEMENTS; DELTA; SOILS; IRON; COPPER; COBALT; MANGANESE; WATER; RIVER DELTAS; HUMUS

Deltaic sediments can alter their trace-element composition by mobilization of these elements as soluble metallo-organic complexes, the mobilization depending on the element, (iron less than copper greater than cobalt greater than manganese), and on the quantity and decomposition of organic matter. Depending on the richness of the relevant river in trace elements, organic matter in the delta, and distance from the river, marginal or submarginal conditions for plant nutrition may appear in adjacent soils. The latter is shown for copper, with reference to the Rhine, Ems, and Chao Phya (Thailand) deltas.

165
The Toxicity of Copper Accumulating in Soils

Delas, J.

Agrochimica, 7, 258-288; 1963

PH; FIXATION; CLAY; ORGANIC MATTER; SOILS; REVIEW; COPPER; CHELATES; IRON

A discussion, with 76 references, of the characteristics of copper toxicity (symptoms, limit values, pH dependence), fixation of copper by clay and organic matter, and physicological causes and control of toxicity. In alkaline soils copper usually becomes fixed in a complex form, but most of the copper in acid soils remains isotopically exchangeable and thus toxic. Correcting soil acidity and application of chelated iron are the best methods of controlling toxicity.

166
Study of the Relationships Between Copper and Organic Matter in a Ferruginous-Humic Podzol Accidentally Enriched with Copper

Delas, J.

C.R. Hebd. Seanc. Acad. Sci., Paris 262D, 2688-2691; 1966

FUNGICIDES; COPPER; SOILS; PH; HUMUS; ORGANOMETALLICS; PODZOL; FERRUALINOUS-HUMIC PODZOL; ORGANIC MATTER

Fungicide treatments had brought the Cu content (n NH_4OAc at pH 7) of the A, and B1 horizons to 603 and 999 mg/kg soil respectively. A study of the humic compounds extracted from these horizons shows that organometallic complexes are formed between Cu and the most mobile fraction of the organic matter.

167
Copper-Organic Matter Complexes in a Podzol Developed on the Landes Sands and Accidentally Enriched with Copper

Delas, J.

Annls Agron., 18, 17-29; 1967

IRON; HUMUS; PODZOL; COPPER; FUNGICIDES

In a Fe-humus podzol treated with Cu fungicides to toxic levels 50 years ago, Cu was bound to the most mobile fraction of the organic matter by stable bonds, some of which occurred in electro-negative complexes.

168
Selective Action of N, N, Di-Methyl-2,2, Diphenylacetamide-Diphenamid and its Behavior in the Soil

Deli, J.

Diss. Abstr. Int. B. Sci. Eng., 30(11), 5209; 1970

MORNING GLORY; HERBICIDES; TRANSLOCATION; PHYTOTOXICITY; OATS; DIPHENYLACETAMIDE; DIPHENAMID

169
Adsorption, Desorption, and Leaching of Diphenamid in Soils

Deli, J.; Warren, G.F.

Weed Sci., 19(1), 67-69; 1971

ADSORPTION; DESORPTION; LEACHING; DIPHENAMID; SOILS; MOVEMENT; CLAY CONTENT; BENTONITE; MUCK; SILT; LOAM; ORGANICS; HERBICIDES

170
Infared Absorption Evidence on Exchange Reaction Mechanism of Copper and Zinc with Layer Silicate Clays and Peat

DeMumbrum, L.E.; Jackson, M.L.

Soil Sci. Soc. Am. Proc., 20, 334-337; 1956

COPPER; ZINC; CLAY; PEAT; SILICATES; EXCHANGE REACTION

171
Copper & Zinc Exchange from Dilute Neutral Solutions by Soil Coloidal Electrolytes

DeMumbrum, L.E.; Jackson, M.L.

Soil Sci., 81, 353-357; 1956

COPPER; ZINC; SOILS; COLLOIDS; METAL EXCHANGE

172
Copper Sulfate in Flooded Cranberry Bogs

Deubert, K.H.; Demoranville, I.E.

Pesticides Monit. J., 4(1), 11-13; 1970

CRANBERRY BOGS; COPPER SULFATE; ALGAL GROWTH; WATER; FLOODWATER; STREAMS; PONDS; COPPER; BOGS; ALGAI

Cranberry bogs are treated with copper sulfate to control algal growth. In order to assess possible water pollution after release of treated floodwater into streams and ponds, the rate of which copper disappeared from the water after treatment was monitored in two separate bogs. In both bogs, the concentration of copper 25 hours after application was higher than expected due to smaller volumes of floodwater. During the first 6 days after treatment, cooper concentrations decreased rapidly and after 10 days, about 95% of the copper had disappeared. When floodwater was released about 4 weeks after treatment, the concentration of copper was at the same level found in the water prior to treatment. (7 references)

173
Arsenic Solubility in a Reduced Environment

Deuel, L.E.; Swoboda, A.R.

Soil Sci. Soc. Am. Proc., 36(2), 1972, 276-278

ARSINE; CLOSED SOIL SYSTEM; SOILS; ARSENIC; SOLUBILITY

174

Incidents of Chromium Contamination of Groundwater in Michigan

Deutsch, M.

Part of Proceedings of the Symposium on Groundwater Contamination, Robert A. Taft Sanitary Engineering Center, Cincinnati, OH, Technical Report W61-5, Public Health Service, U.S. Department of Health, Education, and Welfare, p. 98-104; 1961

CHROMIUM; GROUND WATER; WATER

175

Arsenic Solubility in a Reduced Environment

Deuel, L.E.; Swoboda, A.R.; Texas A & M University, College Station, Texas

Soil Science Society of America Proceedings, 36(2), 276-278; 1972

FLOODS; SOILS; ARSENIC; REDUCTION; IRON; ARSINE

In flooded soils (Houston black clay), soluble arsenic levels were related to the total arsenic content and the reduced environment. Under flooding at 25 and 38C, an E(h) value of 100 mV was the point at which the total arsenic/soluble arsenic ratio became relatively constant. The maximum soluble arsenic content was 4.2% of the total arsenic. The increase in soluble arsenic at low reduction potentials was attributed to the reduction of iron and not of the arsenic itself. Arsine was not detected in any soil sample though the method would have detected even 0.0025 ppm AsH(3) in the soil.

176

The Role of Adsorption in the Fractionation and Distribution of Elements

DeVore, G.W.

J. Geol. 63b, 159-190; 1955

ADSORPTION; FRACTIONATION; DISTRIBUTION; TRACE ELEMENTS

177

Movement and Persistence of Methanearsonates in Soil

Dickens, R.; Hiltbold, A.E.; Auburn University, Auburn, Alabama

Weeds, 15, 299-304; 1967

DISODIUM METHANEARSONATE; DSMA; SOILS; CLAY; LEACHING; OXIDATION; DECOMPOSITION; ARSENIC

Experiments were conducted to determine adsorption of methanearsonate by soils, soil separates, and reference clay minerals from solutions of disodium methanearsonate (DSMA), effects of soil type and pH on the leaching of surface-applied DSMA, and effects of soil type and added organic matter on the oxidation of the methyl carbon of methanearsonate. Adsorption of methanearsonate by kaolinite and vermiculite increased with increasing concentration of DSMA in the equilibrium solution. Kaolinite and limonite adsorbed much more methanearsonate than vermiculite and montmorillonite. The clay fraction of Augusta silt loam adsorbed more methanearsonate than did the sand and silt fractions. Adsorption by whole soils was related generally to their clay contents. Leaching with 20 successive 1-inch increments of water removed 2% of surface-applied methanearsonate from Norfolk loamy sand. Rates of movement of DSMA in Norfolk loamy sand did not differ in three pH levels. About one-half of the applied methanearsonate remained in the surface inch of Decatur clay loam and none was reached below 6 inches. Oxidation of the methyl carbon of methanearsonate was associated with oxidation of soil organic matter in each soil. In three of the soils, there was no evidence of microbiological adaptation of methanearsonate. In Norfolk loamy sand, however, increasing decomposition of methanearsonate relative to soil organic matter occurred with time of incubation. Decomposition of added plant material in this soil enhanced the oxidation of methanearsonate.

178

Environmental Contamination by Lead from a Mine and Smelter, A Preliminary Report

Djuric, D.; Institute of Occupational and Radiological Health, Yugoslavia

Archives of Environmental Health

LEAD; MINES; SMELTERS; CONCENTRATION; AIR; RIVERS; SOILS; VEGETATION; URINE

Fragmentary data on lead concentrations in air, rivers, soil, and vegetation illustrates how a 300 year old mine and smelter contaminated a large region in Yugoslavia. A screening test (urinary excretion of gamma-aminolevulinic acid) applied to a population sample suggests lead absorption may be hazardous. Tables present data on lead concentrations in atmosphere (4 sampling dates), particule distribution, water concentration, soil concentration, plant and food products concentration, ALA urinary concentrations.

179

Study of the Spatial Distribution of Some Mobile Compounds in the Soil Profile

Dmitriyev, Y.A.

Sov. Soil Sci. (Engl. Transl. Pochvovedenie) 3(4), 481-485; 1971

POTASSIUM; FERRI CYANIDE; IODINE; STARCH; COLOR CHANGE; SOILS

180

Zinc in Soils and Farm Crops of the Southern Ukraine

Dobrolyubskii, O,K.; USSR

Mater. Nauch. Konf. Pak. Vinograd.
Plodoovoshchevodstva, Odess. Sel'Skokhoz.
Inst.(26HLA6) 1970, 118-30,; 1970

ZINC; PLANTS; SOILS; SORPTION; CROPS; ACCUMULATION

181
Phenoloxidase Activity of the Soil Under Industrial Contamination Conditions

Dolgova, L.G.; Dnepropetr. Gos. Univ., Dnepropetrovsk, USSR

Pochvovedenie (PVDEAZ), 9, 64-69; 1973

PHENOL; INDUSTRY; SOILS; GRASSES; ENZYMES; MICROORGANISMS; SOILS; PHENOLOXIDASE

182
Phenol-Degrading Capability of Soil Under Industrial Pollution Conditions

Dolgova, L.G.; Kuchma, V.N.; Dnelpropetr. Gos. Univ., Dnepropetrovsk, USSR

Biol. Nauki(BINRBI), 16(12), 109-112; 1973

PHENOL; WASTEWATER; BIODEGRADATION; SOILS; INDUSTRY

183
Study of Lead, Copper, Zinc and Cadmium Contamination of Food Chains of Man

Dorn, C.R.; Pierce, J.O.; Chase, G.R.; Phillips, R.E.; Missouri Univ., Columbia

Final Report, June 26, 1971-Dec. 26, 1972; Missouri University; PB 223 018/3; Contract EPA-68-02-0092; Monitoring Agency Rept. No. EPA-R3-73-034; 121 p.; 1972, Dec.

AIR; ANIMALS; FOOD CHAINS; SOILS; CADMIUM; COPPER; LEAD; ZINC; CATTLE; DUSTS; CROPS; ANALYSIS; LIVER; KIDNEYS; BONES; RESIDUES; VEGETATION; MEATS; MILK; ROOTS; HEAVY METALS

A statistically designed study was conducted in the new lead producing region of Southeastern Missouri to estimate the amount of soil, vegetation, meat and milk contamination by cadmium, copper, lead and zinc. Dustfall, soil, root and vegetation tops were collected 4 times during a one year period at varying distances from the highway on a test farm exposed to lead production sources of heavy metal contamination and on a control farm outside the lead production area.

184
Decomposition of Pyrimidine Derivatives in Soil. The Effect of Specific Microflora and Specific Preincubation

Drobnikova, V.; Pospisilova, V.; University Prague, Czechoslovakia

Zentralblatt fur Bakteriologie. Parasitenkunde. Infektionskrankheiten und Hygiene, Zweite Abteilung, 127(1), 98-112; 1972

DECOMPOSITION; PYRIMIDINE; SOILS; MICROFLORA; INCUBATION; THYMINE; URACIL; CHERNOZEM; OXIDATION; RENDZINA SOILS; RESPIRATION CURVE

The basic types of respiration curves of thymine and uracil showed that both substrates underwent oxidation in a chernozem, apparently due to the presence of the enzyme-complex uracil-thymine-oxidase; only thymine was oxidized in a rendzina that lacked this enzyme-complex. Specific preincubation promoted the process of oxidation, and the same occurred when specific bacteria (growing on thymine and uracil) isolated from the chernozem were inoculated into the soils.

185
The Effect of the Application of Various Mining and Industrial Wastes on the Productivity of Light Soils. Part 3. The Influence of Waste Materials on Plant Crops

Droese, M.; Fabijanski, J.; Radecki, A.; Smierzchalski, L.; Zimniak, Z.; Department of General Soil and Plant Cultivation, Warsaw Agricultural University, Poland

Roczniki Gleboznawcze, 23(1), 101-122; 1972

MINING; INDUSTRY; WASTES; SOILS; CROPS; POTATOES; OATS; RYE; VETCH; SILICA; SANDY SOILS; PHOSPHATES; DOLOMITE; SERPENTINITE; COPPER

The effects of 20 waste materials on a rotation of potatoes-oats-rye-vetch were compared. Those with a good or poor beneficial effect and those with a negative effect were distinguished. The most effective wastes included silica with added phosphate meal, dolomite or serpentinite and copper mine wastes. Best results were obtained from applications of 40-60 tons/ha mixed with the top 20cm of soil especially on sandy soils.

186
Importance of Humic Acids in Concentrating Trace Elements in Soils

Drozdova, T.V.

; 1968

REVIEW; HUMIC ACIDS; TRACE ELEMENTS; SOILS

A review with 22 references.

187
Specific Adsorption of Copper by a Number of Soils

Du Plessis, S.F.; Burger, R.D.; Navorsingsinst. Sitrus Subtrop. Vrugte, Nelspruit, S. Africa

Fert. Soc. S. Afr. J. (FSAJA6), 1(1), 31-33

COPPER; SORPTION; SOILS; PH; ADSORPTION

188
The Displaceability of Specifically Adsorbed Copper from Clay Minerals

Du Plessis, S.F.; Burger, R.D.

Agrochemophysica 3 (2). 1971 17-22.

KAOLINITE; MONTMORILLONITE; ADSORPTION; DISPLACEMENT; COPPER; CLAY MINERALS

189

Microbiological Leaching in the Presence of Ferric Iron

Duncan, D.W.; Walden, C.C.; British Columbia Res., Vancouver, B.C.

Develop. Ind. Microbiol. (DIMCAL), 13, 66-75; 1972

COPPER; BACTERIAL LEACHING; ZINC; FERROOXIDANS; FERRIC ION; LEACHING; MICROBIOLOGY

190

Investigations Concerning Probable Impact of Nitrilotriacetic Acid on Ground Water

Dunlap, W.J.; Cosby, R.L.; McNabb, J.F.; Bledsoe, B.E.; Scalf, M.R.; Robert S. Kerr Water Research Center, Ada, OK

Water Pollution Control Research Series; Monitoring Agency Rept No. W72-07223, EPA-16060-GHR-11/71; Proj. EPA-16060-GHR; 69 p.; 1971, November

ACETIC ACID; WATER; CHELATES; DETERGENTS; GROUND WATER; HYDROLOGY; CHELATION; METALS; BIODETERIORATION; ADSORPTION; SOILS; LEAD; CADMIUM; AQUIFERS; TRACER ACETIC ACID; AMINES; NTA; NITRILOTRIACETIC ACID; MODEL; SORPTION; DEGRADATION; IRON; ZINC; CHROMIUM; MERCURY; MOVEMENT

The fate and effect of NTA both in ground waters and in soil profiles overlying ground waters were studied using laboratory models. Sorption of NTA on soils slows its movement into and through ground waters. Sorption is not sufficient to prevent or greatly reduce potential pollution of ground water by NTA used as a detergent builder. NTA infiltrating through most unsaturated soils undergoes rapid and complete degradation and contributes only inorganic nitrogen compounds and carbonate to ground waters. NTA infiltrating through saturated soils experiences only very limited degradation, with a major portion entering ground water intact. Any NTA which escaped degradation during infiltration through soils could transport such metals as iron, zinc, chromium, lead, cadmium, and mercury from soils into ground waters. NTA would degrade slowly in essentially anaerobic ground-water environments.

191

Probable Impact of Nitrilotriacetic-Acid on Ground Water

Dunlap, W.J.; Cosby, R.L.; McNabb, J.F.; Bledsoe, B.E.; Scalf, M.R.

Ground Water, 10(1), 107-117; 1972

SOILS; SORPTION; DEGRADATION; METALS; MODEL AQUIFERS; NTA; NITRILOTRIACETIC ACID; GROUND WATER

192

An Overview of Trace Element Distribution Patterns in Water

Durum, W.H.; Hem, J.D.; U.S. Geological Survey, Water Resources Division

Part of Hopps, H.C. (Ed.), Cannon, H.L. (Ed.), Annals of the New York Academy of Sciences, Volume 199, Geochemical Environment in Relation to Health and Disease (p. 26-36); 1972, June 28

ARSENIC; CADMIUM; COBALT; LEAD; ZINC; MERCURY; COMPLEXES; SEDIMENTS; GEOGRAPHIC VARIATIONS; SORPTION; SOILS; IRRIGATION; WATER; TRACE ELEMENTS; PLANTS; RAINWATER; STREAMS

The data presented in this study suggest, as one would expect, that the heavy metals determined by modern techniques of atomic absorption and neutron activation analysis are widely distributed in low concentrations in water. There is some evidence that the concentration levels are related to man's activities in some cases, but there appears to be no widespread occurrence of these metals in water exceeding current standards. In the thickly populated areas of New England and the northeast, cadmium and lead appear to be detected more frequently than in other regions of the United States. A similar pattern for lead fallout in rainwater has been observed by others for the well-watered northeast and southeast. The current survey shows essentially no areas of excessive lead in water, but the widespread presence of small amounts of lead in water supplies that chemically favor retention of lead warrants careful attention. It is recognized that minor elements and organic compounds in water can occur in the dissolved phase or in association with sediment. Material in the bed of the stream serves as an integrator of chemical and biological processes that occur in the stream and should be an indicator of the nature of the solids suspended in the stream during periods of higher flow.

193

Relation between Sulfur Oxide Concentration in Atmosphere and Heavy Metal Pollution in Soil

Eda, S.; Obirin Junior Coll., Tokyo, Japan

Kogai to Taisaku (KOTTAM), 8(11), 1067-73; 1972

SULFUR OXIDES; SMELTERS; HEAVY METALS; CADMIUM; SOILS; COPPER; LEAD; ZINC; ATMOSPHERE; AIR

194

Impact on Man of Environmental Contamination Caused by Lead

Edwards, H.W.; Corrin, M.L.; Grant, L.O.; Hartman, L.M.; Reiter, E.R.; Colorado State Univ., Fort Collins, CO

Progress Report, July 1, 1970-June 30, 1971; PB-223 623; Monitoring Agency Rept. No. NSF-RA/E-72-003; Grant NSF-GI-4; 180p.; 1971, July

LEAD; AIR; EXHAUST GASES; FUEL ADDITIVES; ACCUMULATION; RESIDUES; SOILS; LEACHING; GAS ANALYSIS; TISSUEWEATHER MODIFICATION; NUCLEATION; PLANTS; FUELS; AUTOMOBILE EMISSIONS; HUMANS; EXHAUST; TRANSPORT; BICACCUMULATION

The objectives of the research was to develop and test an interdisciplinary approach to environmental problems using lead as an example, and to evaluate consequences of lead pollution from traffic exhaust and economic and technological effects of steps taken to reduce lead pollution from this source. Emphasis during the phase of the program covered in this report is upon pilot experiments to determine where, in what forms, and at what rate lead from traffic exhaust is accumulating in the environment. The topics covered include atmospheric transport, atmospheric chemistry, inadvertent weather modification, bioaccumulation, lead in soil and plants, economic aspects, and chemical analysis.

195
Fate of Cacodylic Acid in Soils and Plants

Ehman, P.J.; Wisconsin Alumni Research Foundation, Madison, Wisconsin

Ansul Chemical Company, Marinette, Wisconsin, 17 p.; 1963, December 26

AGRICULTURE; CACODYLIC ACID; SOILS; PLANTS; BEANS; CABBAGES; CORN; POTATOES; TOMATOES; CARROTS; SOYBEANS; ANSAR-138; ADSORPTION; RESIDUES; RATS; ANIMALS; CONCENTRATION; ARSENIC

Seven field crops, grown in a soil treated with 5 lb/acre of 100% cacodylic acid, showed no significant arsenic residue in the edible portions. Cacodylic acid, when applied to soils as a water solution, is quite firmly surface adsorbed by the soil particles. A small but steady leaching of cacodylic acid occurs in watered soils. Cacodylic acid applied to a sod surface becomes rather evenly distributed at a 10-inch depth in about one week. The smoke, from burning grass previously treated with cacodylic acid showed increased irritation to mucous membranes of the lungs of rats, over smoke from burning untreated grass. No other toxic effects resulting from smoke inhalation were noted.

196
Biogeochemistry of the Minor Elements in Soil

Ehrlich, H.L.; Department of Biology, Rensselaer Polytechnic Institute, Troy, NY

Part of McLaren, A.D. and Skujins, J. (Eds.), Soil Biochemistry, Vol. 2, New York, Marcel Dekker, Inc. (p. 361-384); 1971

SOILS; REVIEW; MICROBIOLOGY; BIOGEOCHEMISTRY; COBALT; NICKEL; COPPER; ZINC; MOLYBDENUM; MANGANESE; IODINE; VANADIUM

A review, with 143 references, of microbial action on Group V and Group VI elements vanadium, manganese, cobalt, nickel, copper, zinc, molybdenum and iodine.

197
Reaction of Copper Tetrammine with Bentonite Clay

El-Sayed, M.H.; Burau, R.G.; Babcock, K.L.

Soil Sci Soc am Proc 35 (4) 1971 571-574

CALCIUM; SORPTION; ISOTHERM; ION EXCHANGE; CLAY; COPPER; TETRAMMINE; BENTONITE CLAY

198
Copper II-Anion Complexes in Clay Systems

El-Sayed, M.H.; Burau, R.G.; Babcock, K.L.

Soil Sci., 110(3), 202-207; 1970

COPPER; CLAY; COMPLEXES; ANIONS

199
Cation and Anion Interchange with Zinc Montmorillonite Clays

Elgabaly, M.M.; Jenny, H.

J. Phys. Chem., 47, 399-408; 1943

CATION EXCHANGE; ZINC; ANION EXCHANGE; CLAY; MONTMORILLONITE

200
Effect of EDTA on the Self Diffusion of Zinc in Aqueous Solution and in Soil

Elgawhary, S.M.; Lindsay, W.L.; Kemper, W.D.

Soil Sci Soc Amer Proc 34 (1) 1970 66-70

CHELATING; EDTA; DIFFUSION; ZINC; SOILS

201
Adsorption Reactions of Micro Nutrients in Soils

Ellis, B.G.; Knezek, B.D.

Part of Mortvedt, J.J.; Giordano, P.M.; Lindsay, W.L., (Eds.), Micronutrients in Agriculture, Proceedings of a Symposium Held at Muscle Shoals, Alabama, April 20-22, 1971. Soil Science Society of America, Inc.; Madison, WI (p. 59-78) 666 p.; 1972

IRON; ALUMINUM; CLAY; NUTRIENTS; ADHESION; LANGMUIR EQUATION; BINDING; ADSORPTION; SOILS; MICRONUTRIENTS; FREUNDLICH ISOTHERM

202
The Diffusion of Copper, Manganese, and Zinc as Affected by Concentration, Clay Mineralogy and Associated Anions

Ellis, J.H.; Barnhisel, R.I.; Phillips, R.E.

Soil Sci. Soc. Am. Proc., 34, 866-870; 1970

COPPER; MANGANESE; ZINC; CLAY; MINERALS; ANIONS; CONCENTRATION; DIFFUSION

203
Removal of Heavy Metals from Acid Bath Plating Wastes by Soil

Emig, D.K.; Purdue University, Lafayette, IN

Univ. Microfilms, Ann Arbor, Mich., Order No. 73-28,071, Diss. Abstr. Int. B, 34(6), 2661; 1973

PLATING; PLATING BATH; WASTE DISPOSAL; SOILS; SORPTION; HEAVY METALS; ACID BATH

204
Relative Leaching Potential Estimated from Hydrologic Soil Groups

England, C.B.

Part of Proceedings of the 8th American Water Resources Conference, St. Louis, 30 Oct.-2 Nov. 1972, p. 105 (Proc. Ser. No. 16); 1972, November

LANDFILLS; LEACHING; SOILS; WATER; HYDROLOGY

205
Chemical Contaminants Found in Surface and Subsurface Water as Related to Soil and Climatic Conditions

Epstein, E.; Struchtemeyer, R.A.

U.S. Gov. Res. Dev. Rep. 70(15), 40 PB-191 811; 1970

DDT; PESTICIDES; WATER; SOILS

206
Trace Elements and Colloids in Soils

Ermolenko, N.F.; Nauka i Tekhnika, Minsk, USSR

English Translation of the Second Russian Edition, 259p.; 1966, in Russian; 1972, in English

SOILS; CLARKE VALUE; PLANTS; ANIMALS; WATER; TRACE ELEMENTS; SOIL COLLOIDS; CCLLOIDS; CLAY; HUMIC ACIDS; MONTMORILLONITE; ION EXCHANGE; CATION EXCHANGE; THIXOTROPY; ADSORPTION; BIOGEOCHEMISTRY; FERTILIZERS; ENZYMES; DEFICIENCY; GROWTH STIMULATORS; SELENIUM; SYMPTOMOLOGY; HUMANS; OXYGEN; CARBON; HYDROGEN; CALCIUM; POTASSIUM; NITROGEN; SILICON; MAGNESIUM; PHOSPHORUS; SULFUR; SODIUM; COPPER; VANADIUM; CHROMIUM; BROMINE; GERMANIUM; NICKEL; LEAD; TIN; ARSENIC; COBALT; LITHIUM; CHLORINE; IRON; ALUMINUM; BARIUM; STRONTIUM; MANGANESE; BARIUM; TITANIUM; FLUORINE; ZINC; RUBIDIUM; MOLYBDENUM; URANIUM; CESIUM; IODINE; MERCURY; RADIUM; CONCENTRATION; CONCENTRATION FACTOR; BLOOD; HORMONES; HUMUS; CEREALS; SOLUBILITY; PH; LIMING; TOTAL; AVAILABILITY; MOBILITY; IRON HYDROXIDES; ALUMINUM HYDROXIDES; PEPTIZATION; PODZOL; BOG SOILS; SANDY SOILS; CATTLE; VITAMIN B12; GROUND WATER; MINERAL SPRINGS; WATER HARDNESS; GEL; FULVIC ACIDS; ABSORPTION SPECTRA; CHROMATOGRAPHY; CHEMISORPTION; ZEOLITES; GOITER; GOUT; SUGAR BEETS; UROV DISEASE; NITROGEN FIXATION; INDUSTRIAL WASTES; BORON; ANALYTICAL METHODS; CHELATES; RADIOTRACER TECHNIQUES

A discussion on the distribution of trace elements in the various types of Russian soils, the identification of geochemical provinces with excesses or, more frequently, deficiencies of certain trace elements and the symptoms of the endemic diseases produced in plants and animals, and the large scale efforts to correct the situation by using appropriate industrial or mining wastes (usually incorporated in other fertilizers to improve uniformity of application, since local excesses may also produce damage). Includes considerable knowledge on elemental abundances (in soils, water, plants, and animals), on soil colloids, on ion exchange and adsorption, on thixotropy, on humus and humic and fulmic acids, on methods of correcting trace element deficiancies by microfertilizers or certain excesses by reducing mobility by liming, and on trace element activation of enzymes and selective absorption of trace elements by plants.

207
Zinc and Cadmium Pollution of Soils and Plants in the Vicinity of a Zinc Smelting Plant

Ernst, W.

Ber. Deut. Bot. Ges., 85(7-9), 295-300; 1972

AIR; CADMIUM; ANALYSIS; CROPS; PLANTS; EMISSIONS; FOOD CHAIN; HEAVY METALS; SOILS; ZINC; SMELTERS; SMELTER PLANTS

Both metals were found to have increased up to one hundred times in soil and plants, decreasing biological activity. The food chain may easily be entered this way.

208
Effect of Chelates on the Movement of Fission Products through Soil Columns

Essington, E.H.; Nishita, H.; University of California, Los Angeles, California

Plant and Soil, 24(1), 1-23; 1966

STRONTIUM; ZINC; YTTRIUM; CESIUM; PROMETHIUM; MOVEMENT; SOILS; CHELATION; IRRIGATION; WATER; RADIONUCLIDES

The effect of a number of chelating agents present in distilled water, and mock irrigation water, were studied as to the movement of radionuclides from columns of calcareous soil. (CWP)

209
Soil-Plant Response to Surface-Applied Mercury

Estes, G.O.; Knoop, W.E.; Houghton, F.D.; Dep. Plant Sci., Univ. New Hampshire, Durham, NH

J. Environ. Qual.(JEVQAA) 1973, 2(4) 451-2; 1973

MERCURY; SOILS; VELVET BENTGRASS; FUNGICIDES; ORGANOMERCURIALS; TURF PLANTS; MANGANESE; ZINC; IRON; COPPER; PLANTS; PHYTOTOXICITY; GRASSES; TRANSITION ELEMENTS; BENTGRASS

No phytotoxicity was observed in velvet bentgrass (AGROSTIS CANINA) grown in soil containing 455 ppm mercury. The soil had been treated annually with 2.10 kg/ha as metallic mercury in organomercury fungicides for 15 years. Turf plants contained 1.68 ppm mercury with normal levels of other transitional elements that is manganese, iron, copper, and zinc.

210
Montmorillonite Exchangeable Thallium and Lead Cations

Fajnor, V.; Masar, J.; Fac. Nat. Sci., Comenius Univ., Bratislava, Czechoslovakia

Acta Fac. Rerum Natur. Univ. Comenianae, Chim. (AFRCAQ), 18, 13-19; 1973

MONTMORILLONITE; LEAD; THALLIUM; CATIONS

211
Peats as Cation Exchangers in the Production of Horticultural Soils

Feige, W.

Acta Hortic, 18, 26-36; 1971

DECOMPOSITION; METALS; CATIONS; SATURATION; PEAT; HORTICULTURE; SOILS

212
Distribution of Copper, Lead, Zinc, Nickel, and Cobalt in Soil in Relation to pH Changes

Filipovic, Z.; Stankovic, B.; Dusic, Z

Soil Science, 91, 147-150; 1961

DISTRIBUTION; PH; COPPER; LEAD; ZINC; NICKEL; COBALT; SOILS

213
Adsorption of Anionic Detergents by Soils

Fink, D.H.; Thomas, G.W.; Meyer, W.J.

J. Wat. Pollut. Contr. Fed., 42(2), 265-271; 1970, February

ADSORPTION; DETERGENTS; SURFACTANTS; PHOSPHORUS; PHOSPHATES; SEWAGE; SOILS; WASTE DISPOSAL; RED CLAY; CLAY; WASTE

Adsorption is high if iron and clay contents are high and cation capacity is low. Sands have low and red-clays high capacities.

214
Distribution of Lead 210 and Radium 226 in Soil

Fisenne, I.M.; Atomic Energy Commission, New York

UCRL-18140, Part of 13th Meeting on Bioassay and Analytical Chemistry, Berkeley, California, (p. 145-158)

RADIUM 226; LEAD 210; DISTRIBUTION; MOVEMENT; SOILS; SOIL PROFILES

The Ra 226 and Pb 210 content of typical tobacco-growing soil was studied as a function of depth. The depth profile samples, including surface vegetation, were collected at an undisturbed area in Maryland. It was of interest to determine whether these nuclides concentrate in the upper horizons of this soil type. Pb 210 generally decreased with increasing depth, resulting in a decrease in the Pb 210/Ra 226 ratio. An attempt was made to correlate this trend with the known radon emanation rates from soil.

215
Potential Environmental Chemical Hazards Part 3. Industrial and Miscellaneous Agents

Fishbein, L.; Flamm, W.G.

Sci. Total Environ., 1(2), p. 117-140; 1972, August

BIBLIOGRAPHY; BIOCONVERSION; CHLORINATED HYDROCARBONS; FOOD CHAINS; CONCENTRATION; ORGANIC MATTER; HAZARDOUS CHEMICALS; HERBICIDES; PESTICIDES; POLYMER; ORGANOMETALLICS

Selected chemicals, e.g., polymer and plastic ingredients, rubber additives, brightening agents, etc., are cited. Their structure, mode of entry into the ecological system, and known biological and toxicological effect are detailed. (131 references)

216
Effects of Phosphate Sources on Copper and Zinc Movement From Mixed Fertilizers and Band Placement

Fiskell, J.G.A.; Breland, H.L.; Locascio, S.J.

Proc. Soil Crop Sci. Soc., Florida, 27, 35-49; 1968

WATERMELONS; DIAMMONIUM PHOSPHATES; AMMONIATED SUPERPHOSPHATE; SUPERPHOSPHATE; FINE SANDS; SAND; FERTILIZERS; PH; PHOSPHORUS; ZINC; COPPER

In field experiments with watermelons, phosphorus as diammonium phosphate, ammoniated superphosphate or ordinary superphosphate was applied at 0, 39, 78 and 146 kg/ha to Leon fine sand and 0, 115 and 230 kg/ha to Immokalee fine sand. Each fertilizer had 0.56 and 4.47 kg/ha or 0, 2.4, and 4.5 kg/ha copper as copper sulfate added in the Leon and Immokalee experiments, respectively. Significant differences were found for effects of phosphorus sources and rates on pH, soluble salts, zinc and copper extracted. In the field, copper particles were seen to remain in the fertilizer band. In laboratory studies, the amounts of copper, zinc and phosphorus that diffused from mixed fertilizer through filter paper were nearly in proportion to their contents in the fertilizer, but the presence of phosphorus in the fertilizers greatly reduced the solubilities of copper and zinc.

217
The Effect of Some Herbicides on the Retention of Mobile Phosphorus Forms and Potassium in the Soil of the Ukraine Steppes

Fisyunov, A.V.; Vsesoyuznyl Nauchno-Issledovatel'skii Institut Kukuruzy, Ussr

Dokl Vses (Ordena Lenina) Akad S-Kh Nauk im V I Lenina, (3), 1972, 11-13

CORN; SOYBEANS; PEAVINE; CHICK-PEA; LENTIL; WINTER WHEAT; SIMAZINE; PROPAZINE; CHLORAZINE; ATRAZINE; SOILS; PHOSPHORUS; POTASSIUM; MOBILITY

In a 3-year experiment on ordinary heavy loamy chernozem, triazines did not affect the mobile-p content of the plowed layer. Any changes in the mobile-k content disappeared a year or two after application.

218
Seleniferous Vegetation and Soils in the Eastern Yukon

Fletcher, K.V.; Doyle, P.; Brink, V.C.

Can J Plant Sci 53 (3) 1973 701-703

VEGETATION; SOILS; SELENIUM

219
Profile Distribution of Zinc, Iron, Manganese, and Copper in Colorado Soils

Follett, R.H.; Lindsay, W.L.; Colorado State University, Fort Collings, Colorado

Tech. Bull. Colo. St. Univ. 110, p. 79; 1971

ZINC; IRON; MANGANESE; COPPER; PH; SOILS; AVAILABILITY; DISTRIBUTION; CLAY

In 37 series available Zn increased with increasing organic matter and/or CEC, available Fe decreased with increasing soil pH, and available Mn increased with increasing organic matter and decreased with increasing soil pH and lime content. Available Cu increased with both total Cu and clay content. Available Zn, Fe, Mn and Cu decreased with depth in the soil profiles but the total contents of these elements showed a relatively uniform distribution.

220
The Absorption of Zinc on Bentonite and Kaolinite in the Presence of Complexing Agents

Fortini, S.; Tarantola, M.H.

Agrochimica, 6, 174-182; 1962

ADSORPTION; BENTONITE; KAOLINITE; MONOSODIUM TARTRATE; AQUEOUS LEAF EXTRACTS; CATION SATURATION; PH; DISODIUM; NITRILIC-TRIACETATE; SALTS; EDTA; ZINC; CLAY; CHELATES

Zinc adsorption on bentonite and kaolinte was measured using zinc 65 in the presence of chelating agents, monosodium tartrate and aqueous leaf extracts from VICA FABA or HEDYSARUM CORONARIUM. Competition between clay and chelating agents for zinc plus 2 was affected by the state of cation saturation of the clay, the reactant concentration, the pH of the solution, and the stability of the complexes formed. The extraction of newly administered zinc was almost complete with an adequately concentrated solution of disodium nitrillic-triacetate, but less complete with salts of EDTA. The plant extracts held much of the zinc plus 2 in complex form while preserving its availability.

221
Behavior and Side Effects of Benomyl

Frahm, J.; Univ. Hohenheim, Stuttgart-Hohenheim, Ger.

Z. Pflanzenkr. Pflanzenschutz (ZPFPAA), 80(7), 431-446; 1973

REVIEW; BENOMYL; MUTAGENICITY; BENZIMIDAZOLECARBAMATE; EARTHWORMS; MITES; PERSISTENCE; NEMATODES; APHIDS; PLANTS; SOILS; WORMS; INSECTS

The toxic effects of benomyl on non-target organisms including earthworms, nematodes, mites, and aphids; the persistence of 2-benzimidazolecarbamate metabolite, in plants and soil; and the mutagenicity of benomyl and 2-benzimidazolecarbamate are reviewed.

222
Organic Sequestration of Copper

Fraser, D.C.

Econ. Geol., 56, 1063-1078; 1961

COPPER

223
Absorption of Trace Elements Copper and Cobalt by Some Field Cultures in Relation to the Content of Organic Matter in Soil

Freiberga, G.Y.

Izv Akad Nauk Latv SSR (2), 116-121; 1970

SOILS; FIELD CULTURES; ABSORPTION; TRACE ELEMENTS; COPPER; COBALT; ORGANIC

224
Adsorption and Transport of Agricultural Chemicals in Watersheds

Frere, M.H.; Water Quality Management Lab., ARS, USDA, Durant, OK

Trans. ASAE (Amer. Soc. Agr. Eng.) 16(3), 569-572; 1973

MODEL; ADSORPTION; TRANSPORT; SOILS; WATER; PLANTS; AGRICULTURE; WATERSHEDS; DEGRADATION; VOLATILIZATION; MOVEMENT; FERTILIZERS; PESTICIDES; RUNOFF; PHOSPHATES; EROSION; STREAMS; TRANSPORT; HERBICIDES

A model describes the pathways of chemicals in the soil-water-plant system important to their movement in watersheds. Method of application, adsorption, degradation, and volatilization affect the pathway of the chemical, while hydrologic factors control the speed of movement and amount of chemical moved. Interactions involved have been illustrated in a hypothetical example.

225
Cadmium in the Environment, 2

Friberg, L.; Piscator, M.; Nordberg, G.; Kjellstrom, T.; The Karolinska Institute, Stockholm 60, Sweden

EPA-R2-73-190, 169p.; 1973, February

CADMIUM; ANALYTICAL METHODS; INTERFERENCES; ATOMIC ABSORPTION SPECTROPHOTOMETRY; BLOOD; URINE; RICE; GRAINS; POLORAGRAPHY; PLANTS; VEGETABLES; NEUTRON ACTIVATION ANALYSIS; AIR; URBAN; SMELTERS; MOSSES; RURAL; DUSTS; WATER; DRINKING WATER; SOILS; CONCENTRATION; SEWAGE SLUDGE; UPTAKE; FOODS; WHEAT; FISH; TOBACCO; CIGARETTES; SNUFF; INTAKE; FECES EXCRETION; METABOLISM; ABSORPTION; ANIMALS; MICE; CALCIUM; DEFICIENCY; PLACENTAL TRANSFER; DISTRIBUTION; KIDNEYS; SUBCUTANEOUS; LIVER; PANCREAS; MAMMARY GLANDS; CHROMATOGRAPHY; CADMIUM 109; RATS; ACCUMULATION; BIOLOGICAL HALF LIFE; TRANSPORT; METALLOTHIONEIN; OCCUPATIONAL EXPOSURES; LUNGS; HUMANS; BONES; TERATOGENS; EPIDEMIOLOGY; PROTEINURIA; ELECTROPHORESIS; ITAI ITAI DISEASE

An update of information on cadmium published earlier, this paper discusses analytical methods and new data on the distribution in air, water, drinking water, soils, foods and tobacco products. Cadmium uptake, intake and metabolism, absorption, distribution, excretion, etc. including placental transfer are elaborated. Analyses of blood, urine, liver, kidneys, etc. The biological half time of cadmium in the human body is quite long (one estimate is 9-18 years). Most of the excretion is in the feces, but excretion in urine increases when the kidneys are damaged. Exposure to cadmium causes demineralization in bones and this is worse in calcium deficiency. Epidemiological investigation's in Japan are discussed in some detail.

226
Sorption and Transport in Soils

Frissel, M.J.; Poelstra, P.; Reiniger, P.; Inst. Atom. Sci. Agric., Wageningen, Netherlands

Part of Sorption and Transport Processes Soils, Monogr. Soc. Chem. Ind. 37, 135-151; 1970

TRANSPORT; SOILS; FIXATION; BIOLOGICAL MIXING; PLOWING; MIGRATION; STRONTIUM; STRONTIUM 90; MODEL; SIMULATION MODEL

A simulation model of transport in a heterogeneous soil system is presented which includes a production term (fixation) and biological mixing and plowing. The model is used to describe the migration of strontium 90 fallout in pastures.

227
Chromatographic Transport Through Soils. Part 3. A Simulation Model for the Evaluation of the Apparent Diffusion Coefficient in Undisturbed Soils with Tritiated Water

Frissel, M.J.; Poelstra, P.; Reiniger, P.

Plant Soil, 33(1), 1970, 161-176

TRANSPORT; SOILS; MODEL; DIFFUSION; WATER; TRITIATED WATER; TRITIUM

228
Contamination of the Soil with Mercury

Frissel, M.J.; Poelstra, P.; Reiniger, P.; Das, H.A.; Assoc. Euratom-Ital, Wageningen, Netherlands

Proc., Int. Symp. Radioecol. Appl. Prot. Man His Environ. (27QWAN), 2, 941-55; 1972

SOILS; MERCURY; SOILS; METHYLMERCURY

229
Selenium Accumulation in Soils. Comments

Frost, D.V.; Brattleboro, VT

Geol. Soc. Amer., Spec. Pap., 140, 55; 1972

REVIEW; SELENIUM; SOILS; PLANTS; ANIMALS; ACCUMULATION

230
Cyanide Degradation by an Enzyme from STEMPHYLIUM-LOTI

Fry, W.E.; Millar, R.L.

Arch Biochem Biophys 151 (2). 1972 468-474.

CYANIDE; DEGRADATION; ENZYMES

231
Response of Microbiota to the Presence of Heavy Metals in Soil

Fujihara, M.P.; Garland, T.R.; Wildung, R.E.; Drucker, H.

Annu. Meet Am. Soc. Microbiol. 73, 32; 1973

BACTERIA; FUNGI; CARBON DIOXIDE; EVOLUTION; SILVER; MERCURY; THALLIUM; CHROMIUM; COPPER; COBALT; TUNGSTEN; LEAD; SOILS; HEAVY METALS

232
Residue of an Organoarsenic Pesticide for Controlling Rice Sheath Blight in Rice Plants and Soils in Treated Paddy Fields

Fujimoto, Y.; Kawahara, I.; Nakamura, N.; Agr. Chem. Insp. Sta., Min. Agr. and Forestry, Tokyo, Japan

Bull. Agr. Chem. Insp. Sta., 12, 71-75; 1972

RICE; PESTICIDES; SOILS; PLANTS; RICE SHEATH BLIGHT; ORGANOARSENIC; FUNGICIDES; FERRIC METHANE; ARSENATE; ARSENIC

Organoarsenic fungicides such as ferric methanearsotate are indispensable for controlling rice sheath blight, one of the major diseases of rice plants in Japan. The relationship between the amount of organoarsenicals applied and their residues in rice grain, straw, and soil was studied. The residues of total, inorganic, and organic As (as As_2O_3) were determined in polished and unpolished rice grain, straw, and soil to which ferric methanearsonate had been applied at rates of 5.2-16 g (as As_2O_3)/10 are in four districts. Total amount of As in the soil was unexpectedly high in all districts even in the fields where no arsenic had been applied (rates of 13.5, 55.0, 20.0, and 57.50 ppm). About 54-100% of total As was inorganic, the organic As percentage being very small. In rice grain harvested in paddy fields where the soil contained more than 20 ppm of organic As, unpolished rice grain contained 0.68-1.65 ppm total As and 0.05-0.62 ppm organic As. Total As of less than 1.0 ppm and organic As of less than 0.3 ppm were detected in unpolished rice grain harvested in fields where total As was 60 ppm and organic As very small.

233
Relation Between Cadmium Concentration in Urine and Soil in Itai-Tai Disease District

Fukuyama, Y.; Kawabe, T.; Ishimoto, M.; Kubota, K.; Inst. Hyg. Med. Microbiol., Tokyo, Japan

Igaku to Seibutsugaku(Igsbal) 1973, 86(4) 283-7; 1973

DISEASES; CADMIUM; URINE; SOILS

234
Relation Between Proteinuria and Heavy-Metal Pollution in the Itai-Itai Disease District

Fukuyama, Y.; Kubota, K.; Inst. Hyg. Med. Microbiol., Toyama, Japan

Igaku to Seibutsugaku(Igsbal) 1972, 85(3) 103-6; 1972

HEAVY METALS; SOILS; CADMIUM; PROTEINURIA; LEAD; ZINC; PROTEIN URIA

235
Cadmium, The Dissipated Element

Fulkerson, W.; Goeller, H.E.

Fulkerson, W.; Goeller, H.E.; (Eds.), ORNL NSF-EP-21, Oak Ridge National Laboratory, Oak Ridge, TN 37830, 473 p.; 1973, January

CADMIUM; WATER; SOILS; PLANTS; ZINC; SEWAGE SLUDGE; PRODUCTION RECOVERY; ELECTROPLATING; NICKEL-CADMIUM BATTERIES; RECYCLE; INHALATION; INGESTION; ITAI-ITAI DISEASE; DRINKING WATER; HYPERTENSION; WATER HARDNESS; ANIMALS; METALIOTHIONEIN; ENZYMES; CARCINOGENS; MUTAGENS; TESTES; TERATOGENS; PLACENTA; ASCORBIC ACID; SEDIMENTS; UPTAKE; RICE; OATS; WHEAT; FUNGICIDES; APPLES; LUNGS; LIVER: KIDNEYS: PROTEINURIA; SHELLFISH; AIR; EMISSIONS; ABATEMENT; ANALYSIS; PIGMENTS; PLASTICS; GEOCHEMISTRY; CHEMISTRY; CADMIUM OXIDE; DUSTS; FUMES; SYMPOTMOLOGY; ORTEOMALACIA; FISH; CONCENTRATION; SMELTERS; METALLURGY; CIGARETTES; TOBACCO; SCIDENS; ORE; COAL; FERTILIZERS; PHOSPHATES; FOSSIL FUELS; MOBILITY; AVAILABILITY; FOLIAR DEPOSITION; TRANSLOCATION; PASTURES; HIGHWAY PROXIMITY; COST/BENEFIT ANALYSIS; CADMIUM EMISSIONS; LEAD; COPPER; MICE; VAPOR PRESSURE; CADMIUM SULFIDE; CADMIUM CARBONATE; ORGANIC COMPLEXES; ACID MINE DRAINAGE; PH; SPECTROGRAPHY; RESERVES; LEACHING; ELECTROLYSIS; RECOVERY; EMPHYSEMA; CRITERIA; BATTERIES

A resource analysis of the cadmium (zinc) system is presented in which the following areas are considered: (a) the properties of the elements, especially as these dictate use patterns, movement and measurement in the environment, and biological behavior; (b) the flow in society including the identification of pollution sources and their characteristics and abatement practices; (c) normal and polluted levels of cadmium and zinc in air, water, and food and estimated human dose rate ranges; (d) the toxicology of cadmium especially relative to itai-itai disease and to hypertension and other cardiovascular ailments; (e) the movement and effects of cadmium in ecosystems as studied in the vicinity of large sources such as zinc smelters or in laboratory soil uptake, food chain, and toxicology investigations; (f) costs to the zinc industry of cadmium pollution abatement or cadmium use restrictions and the costs to society of potential damages from cadmium pollution; (g) the control of cadmium flow in society including the body of applicable law as well as a discussion of standards; (h) substitutes for cadmium in various uses; (i) conclusions about needed control and about needed information on the flow of cadmium; and (j) recommendations for needed research.

236
State of the Art Report on Migration and Attenuation of Some Trace and Heavy Metals, Asbestos, and Cyanide in Soil

Fuller, W.H.

Draft Report prepared for the Solid and Hazardous Waste Research Laboratory, USEPA, National Environmental Research Center, EPA Contratct No. 68-03-0208, Cincinnati, OH, 1974, June, 130p.; 1974, June

MIGRATION; ATTENUATION; TRACE METALS; HEAVY METALS; ASBESTOS; CYANIDE; SOILS

237
Hydrologic Considerations in Sanitary Landfill Design and Operation

Fungaroli, A.A.; Drexel Inst. Technol., Philadelphia, PA

Proceedings of National Industrial Solid Waste Management Conference, University of Houston, Houston, TX (p.208-2[illegible]; 1972

SANITARY LANDFILLS; LEACHATE; SEEDING ; REFUSE; LANDFILLS; WATER STORAGE; GROUND WATER; SOILS

Most sanitary landfills have the potential for generating pollutant carrying lechate. Leachate quantity depends on geographic location, surface drainage characteristics, and surface treatment, such as seeding. Whenever the net water infiltration is positive, leaching is inevitable. Refuse field capacity increases significantly as refuse size decreases. With increasing dry density, the increase of refuse field capacity will asymptotically approach a maximum which is size dependent. Time of first leachate appearance can be greatly shifted by adjusting refuse and soil physical parameters and placement time. However, it is probable that placement time is not really controllable to any large degree. Leachate production can be attributed to one or all of the following sources: refuse compaction and placement, channeling, an advanced wetting front, and the main wetting front. Finally, because of their unique storage and behavior capabilities, landfills are able to develop mounds of water storage which locally raise the groundwater table. This is particularly signifcant where the hydraulic characteristics of the landfill system are very different from the surrounding soils, and where a local depression is filled.

238
Retention of Certain Radioactive Ions by the Suspensions of Surface Basins and by Certain Active Earths in Rumania

Furnica, G.; Institute of Hygiene, Bucharest, Romania

CONF-690918-(Vol. 2), From Conference on Radioecology, Cadarache, France, (p. 181-200); 1970

ADSORPTION; CHELATES; DEPOSITS; HYDROLOGY; ROCKS; SLURRIES; SOILS; CESIUM 134; IODINE 131; IRON 59; SILVER 110; SODIUM 22; STRONTIUM 85; ZINC 65; RIVERS; MUD; PH; SILT

A study was made of the retention, by mud taken from the river of Dimbovitza-Bucharest, of the isotopes Na 22, Sr 85, Ag 110, Cs 134, Zn 55, Fe 59, and I 131 dissolved in the water. These isotopes are fixed by the mud in different proportions, i.e., 15 percent Na, 45 percent Sr, 37 percent I, 97 percent Zn, 95 percent Fe, or 98 percent Cs. By elution of the mud retaining Na 22, Sr 85, or Ag 110, a phenomenon of ion exchange between the radioactive ions and the natural product was observed. The sand fixes separately: 3.6 percent Na, 22 percent Ag, 72 percent Zn, 8.8 percent I, 99 percent Cs, 93 percent Sr, or 94 percent Fe. Treatment of the sand with 5 percent HNO_3 or 10 percent HCl alters the radioactive ion retention capacity. Similar determinations were made with montmorillonitic bentonites, the retention observed being greater with respect to Cs and smaller with respect to Na.

239
Decomposition of Organic Mercurial Compounds by Mercury-Resistant Bacteria

Furukawa, K.; Suzuki, T.; Tonomura, K.

Agr. Biol. Chem., 33, 128-130; 1969

DECOMPOSITION; BACTERIA; MERCURY; MERCURIALS; ORGANOMERCURIALS

240
Study of the Sorption of Lead by Hydrous Ferric Oxide

Gadde, R.R.; Laitinen, H.A.

Environ. Lett. (EVLTAX), 5(4), 223-35; 1973

ADSORPTION; ANALYSIS; HEAVY METALS; LEAD; SEDIMENTS; SOILS; CLAY; DESORPTION; MANGANESE HYDROXIDE; FERRIC HYDROXIDE

Clay fractions of soils which are known to contain hydrous oxides of iron and manganese show strong absorption of heavy metals which are desorbed under acid conditions causing environmental problems.

241
Sorption of Lead by Hydrous Ferric Oxide

Gadde, R.R.; Laitinen, H.A.; Sch. Chem. Sci., Univ. Illinois, Urbana, Ill.

Environ. Lett. (ENVLTAX), 5(4), 223035; 1973

LEAD; SORPTION; HYDROUS IRON; OXIDES; SOILS; FERRIC OXIDE; PH; SEDIMENTS; DRAINAGE; ACID MINE RUNOFF; ADSORPTION; ANALYSIS; CLAY

Sorption of lead on synthetic hydrous ferric oxide as a function of lead concentration and pH is described. The environmental consequences of reversible lead sorption with pH are discussed. Hydrous ferric oxide, whether in soils, sediments, or acid mine runoffs can adsorb large amounts of lead at a favorable pH and release it quickly as the pH decreases.

242
Desorption of Arsenates from Soils by Water

Galba, J.; Vys. Sk. Polnohospod., Nitra, Czech.

Pol'Nohospodarstvo(POLNAJ) 1972, 18(11) 945-52; 1972

ARSENATE; SOILS; DESORPTION; WATER

243
Arsenate Sorption in Soils. 3.Effect of Soil Solution pH On the Intensity of Arsenate Sorption

Galba, J.; Univ. Agric., Nitra, Czech.

Pol'Nohospodarstvo (POLNAJ) 18 (12) 1055-61; 1972

ARSENATE; SORPTION; SOILS; PH; ARSENIC

The sorption of arsenates by soil types ranging from illimerized brown earth to calcareous meadow soil was studied. The amount of arsenic sorbed was less at higher pH and the change in the intensity of sorption was also related to the nature of the colloidal fraction.

244
Rate of Sorption of Arsenates by Soil in the Presence of Various Concentrations of Salts

Galba, J.; Vysoka skola pol'nohospodarska, Nitra, Czechoslovakia

Pol'nohospodarstvo 18, 734-741

SORPTION; ARSENATE; SOILS; ARSENIC; SALTS; SORPTION RATE

An increase in the concentration of salts increased the amount of arsenate sorbed in the order $Ca(NO_3)_2$ greater than KCl greater than $(NH_4)_2SO_4$ greater than $NaNO_3$. Sorption rate was closely related to the $CaO + MgO:Al_2O_3 + Fe_2O_3$ ratio.

245
Migration and Leaching of Metals from Old Mine Tailings Deposits

Galbraith, J.H.; Williams, R.E.; Siems, P.L.

Ground Water, 10(3), 33-44; 1972, May/June

BIOCONVERSION; HEAVY METALS; LEACHING; LEACHATE; MINING; OXIDATION; SAMPLING; WASTES COMPOSITION; WATER; WASTE; MIGRATION; TAILINGS; SULPHATE; GROUND WATER

Microorganisms convert heavy metal to sulphate, which dissolve causing ground water pollution. Below water table sulphate reducing bacteria give precipitation of sulphides, the former being destroyed by acidity at greater depths.

246
Transport of Trace Pollutants in Lead Mining Wastewaters

Gale, N.L.; Hardie, J.C.; Jennett, A.; Aleti, A.; University of Missouri-Rolla, Rolla, Missouri 65401

Part of Hemphill, D.D. (Ed.), Trace Substances in Environmental Health - VI, June 13-15, 1972, University of Missouri-Columbia, Columbia, MO, (p. 95-106) 399 p.; 1972, June

LEAD MINING; WATER; STREAMS; LEAD; MINES; HEAVY METALS; COPPER; ZINC; RESERVOIRS; AQUATIC ECOSYSTEMS; ALGAL; MILL EFFLUENTS; TURBULENCE; WASTEWATER; TRANSPORT

The New Lead Belt Region of Southeastern Missouri, located in a rural heavily wooded region of the Ozarks, became the world's largest lead mining district in 1970. A comprehensive study of the water quality in receiving streams has been made during the past year as part of a continuing interdisciplinary effort to define and quantify the effects of the lead mining industry on the surrounding area. Prior to the full development of the mines, the heavy metals content of area streams was insignificant, with background values for lead, copper, and zinc in the range of 1 to 20 parts per billion. Because of natural conditions present in the New Lead Belt, there is little problem with dissolved heavy metals in regional streams. Results indicate, however, that considerable quantities of finely ground mineral particles may escape flotation and tailings reservoirs and be transported through the aquatic environment, especially during periods of turbulence. In addition to escaping minerals, mine and particularly mill effluents sometimes contain nutrients which encourage the development of complex algal and microconsumer communities. These aquatic forms have been found to trap and assimilate lead in significant quantities. In streams receiving mine and mill effluent, there is an inverse relationship between the content of lead in the organisms of the first trophic level and distance downstream from the sources of contamination.

247
Enzymatic Reduction of Manganese Dioxide in the Soil

Galstyan, A.S.

Dokl Akad Nauk Arm Ssr 55 (2) 1972 (Recd 1973) 106-109

CITRIC-ACID; GLUCOSE; SODIUM; CYANIDE; DEHYDROGENASE; FLAVO PROTEIN; HEAT INACTIVATION; MANGANESE DIOXIDE; SOILS; ENZYMATIC REDUCTION

248
Lead Concentration of Plants Soil and Air Near Highways

Ganje, T.J.; Page, A.L.

Calif. Agric. 26(4), 7-9; 1972

CROPS; WIND; SOILS; LEAD; PLANTS; AIR; HIGHWAYS

249
Sequence of Products Formed During the Denitrification of Senegalese Rice Paddy Soils

Garcia, J.L.

Ann Microbiol (PARIS), 123(3), 351-362; 1973

CARBON; PH; NITROGEN; NITRITE; GAS CHROMATOGRAPHY; RICE; PADDIES; DENITRIFICATION; RICE PADDIES; SOILS; PADDY SOILS

250
Solubility and Redox Criteria for the Possible Form of Selenium in Soils

Geering, H.R.; Cary, E.E.; Jones, L.H.P.; Allaway, W.H.

Soil Sci. Soc. Amer. Proc., 32, 35-40; 1968

SELENIUM; SOILS; REDOX CRITERIA

251
Persistence, Degradation and Bioactivity of Phorate and Its Oxidative Analogues in Soil

Getzin, L.W.; Shanks, C.H., Jr.

J. Econ. Entomol., 63(1), 52-58; 1970

PERSISTENCE; PHORATE; THIN LAYER CHROMATOGRAPHY; GAS-LIQUID CHROMATOGRAPHY; INSECT BIOASSAY; INSECTS; SULFUR OXIDES; SULFONE; SILTY LOAM; CRICKET; GAS CHROMATOGRAPHY; COLUMN CHROMATOGRAPHY; DEGRADATION; BIOASSAY

The persistence of phorate and its five oxidative analogues in soil was determined with thin-layer chromatography, gas-liquid chromatography and insect bioassay. Phorate and its oxygen analogues were rapidly oxidized to their respective sulfoxides and sulfones. Phorate and its sulfoxide and sulfone persisted beyond 16 weeks in a silt loam at 25 degrees C. The thiolate analogues degraded to low levels, within 2 to 8 days. Phorate was highly toxic to a cricket, ACHETA PENNSYLVANICUS (Burmeister), in direct soil bioassay tests. A lack of contact and fumigant toxicity against crickets suggested that phorate sulfoxide and phorate sulfone were tightly absorbed by soil constituents. The toxicity of soil treated with phorate sulfoxide was greater several weeks after application than it was immediately following treatment because small amounts of the sulfoxide were converted to phorate. The conversion of phorate sulfoxide to phorate in soil was verified with gas chromatography, column chromatography and insect bioassay. (17 references)

252
Fate of a Mercuric-Mercurous Chloride Fungicide Added to Turfgrass

Gilmour, J.T.; Miller, M.S.; Dep. Soil Sci., Univ. Wisconsin, Madison, Wi

J. Environ. Qual.(JEVQAA) 1973, 2(1) 145-8; 1973

GRASSES; MERCURY; FUNGICIDES; VOLATILIZATION; SOILS; DISTRIBUTION; UPTAKE; TURFGRASS; ROOTS; METALS; BENTGRASS; CALOCLOR; REMOVAL

Mercury volatilization is the dominant factor in mercury loss from calo-clor applied to turfgrass or soil. When 0.3-1.2 g calo-clor/m2 was applied to creeping bentgrass (AGROSTIS PALUSTRIS) in the greenhouse, 44-56% of the total mercury was lost in 57 days. Plant uptake and removal upon cutting did not account for these losses, which were attributed to volatilization of metallic mercury formed in the turfgrass-soil system. Where additions were made in the turfgrass root zone, loss was reduced, and the redistribution of mercury in the soil followed a pattern which was in qualitative agreement with metallic mercury formation and redistribution. Data from experiments carried out with bare soil supported the findings on mercury volatilization.

253
The Influence of some Soil Forming Factors on the Content and Distribution of Trace Elements in Soil Profiles. Part 1. The Occurrence of Copper and Manganese in Soils with Regard to the Relief

Glinski, J.

Ann Univ Mariae Curie-Sklodowska Sect E Agric 22 1968 21-35.

SPECTRAL EMISSION ANALYSIS; DISTRIBUTION; TRACE ELEMENTS; OCCURRENCE; COPPER; MANGANESE; SOILS

254
The Occurrence of Trace Elements, Copper, Manganese, Cobalt, Nickel, Vanadium, Strontium, and Barium, in the Soils and Hay in the Northern Part of Region of the Wieprz-Krzna Canal

Glinski, J.; Krupinski, A.

Ann Univ Mariae Curie-Sklodowska Sect E Agric 24 1969 67-78.

MARSH; PEAT; OCCURRENCE; TRACE ELEMENTS; COPPER; MANGANESE; COBALT; NICKEL; VANADIUM; STRONTIUM; BARIUM; SOILS; HAY

255
Mercury

Goldwater, L.J.; Clarkson, T.W.

Part of Lee, D.H.K., Metallic Contaminants and Human Health, Academic Press, New York, Chapter 2 (p. 17-55), 241 p.; 1972

MERCURY; CINNABAR; CIRCULATION; LITHOSPHERE; HYDROSPHERE; ATMOSPHERE; WATER; BIOSPHERE; SOILS; PESTICIDES; MERCURIC CHLORIDE; MERCUROUS CHLORIDES; FISH; SHELLFISH; FUNGICIDES; ALKYLMERCURY; ARYLMERCURY; ALKOXYALKYLMERCURY; PHENYLMERCURY; METHYLMERCURY; SLIMICIDES; TUNA; SWORDFISH; VAPOR; FOOD CHAINS; FEATHERS; BIRDS; METHYLATION; BRAIN; ENZYMES; BLOOD BRAIN BARRIER; KIDNEYS; EXCRETION; FECES; INHALATION; PNEUMONITIS; SYMPTOMOLOGY; CONGENITAL DEFECTS; CEREBRAL PALSY; MENTAL RETARDATION; DOSE/RESPONSE RELATIONSHIP; FOODS; BLOOD; BIOLOGICAL HALF LIFE; MICE; RATS; SEALS; MONKEYS; POULTRY; CRABS; PIKE; FLOUNDER; EELS; DRINKING WATER; BLOOD LEVELS; BLOOD PLASMA; OCCUPATIONAL EXPOSURES; ANIMALS

Mercury is one of the least abundant elements, namely about 2.7E-6 percent in the earth's crust. The only commercial ore is the sulfide, cinnabar. Usually the concentration in natural waters is less than 0.1 micrograms per liter but occasionally values up to several micrograms per liter and infrequently higher values. In the lithosphere the range is 3 parts per billion to 10 parts per million. In the atmosphere normal values are 1 to 10 nanograms per cubic meter. There is some circulation of natural mercury, with it evaporating into the atmosphere, being washed out with rain and flowing into the ocean, etc. Man has affected this natural circulation, in some ways and places seriously. Mercury compounds have been used as slimicides in pulp and paper plants, organic mercury compounds have been used as fungicides on seed grain and large quantities of mercury and its compounds have been lost and discharged to streams. Some mercury has evaporated and more has been emitted into the atmosphere as a result of burning coal. Within the last 5 years, it has been found that some of this mercury is methylated, is concentrated in little fish, and even more so in large predator fish and in fish-eating birds, to the point that there is a hazard to man, which has resulted in serious pathological effects in Minamata, Japan. Almost all the methyl mercury is absorbed in both fish and man and has a long biological half life in both, so that with a small steady intake, the level builds up. Graphs of build up and excretion are given. Severe cases of organic mercury poisoning have resulted from eating seed grain treated by mercury fungicides or from eating pork fed on such grain. The predominant feature is permanent organic injury to the brain resulting in weakness, paralysis, loss of vision and disturbed cerebral function. Severe cases become comatose and end fatally. In Minimata, Japan, the problems arose from eating mercury contaminated fish and shellfish, apparently over several years. In both the above cases females without obvious symptoms gave birth to infants with congenital defects such as cerebral palsy, mental retardation, etc. Goldberg points out that various factors have complicated dose-response relationship and that minimal response has often been found with exposures greatly in excess of the accepted threshold value. He points out that the nature of the compound has a considerable effect on the absorption metabolism, excretion, and ability to pass barriers within the body. He says plasma concentrations of mercury are more significant than whole blood values.

256
Contamination of Underground Water by Waste Dumps and Implications for Methods of Residue Removal.

Golwer, A.; Matthess, G.; Schneider, W.

Trib. CEBEDEAU (Cent. Belge. Etude Doc. Eaux Air), 25(347), 428-433; 1972, October

ADSORPTION; BIOCONVERSION; FILTRATION; GASES; GEOLOGY; LANDFILLS; LEACHING; LEACHATES; MUNICIPAL REFUSE; UNDERGROUND AQUIFERS; PRECIPITATION; WATER

Biochemical and geochemical processes, filtration, adsorption, chemical precipitation and dilution all contribute to purification of tip leachate in the 11 metres of ground below a landfill site and down the water gradient.

257
Identification of the Active Ligands Chelating Zinc in Some Plant Water Extracts

Gomah, A.M.; Davies, R.I.; Biochemistry and Soil Sciences Dept.; University College of North Wales, Bangor/Caernarvonshire, Wales

Plant Soil (PLSOA2), 40(1), 1-19; 1974

ZINC; CHELATES; PLANTS; PHENOL; BARLEY; ELLAGIATE; CATECHIN; EXTRACTS; LIGANDS

258
Decomposition of Metal Humic-Acid Complexes by Microorganisms

Gordienko, S.; Glushchenko, T.; Ivahno, L.

Part of Szegi, J. (Ed.), Proceedings of the Symposium on Soil Microbiology, Vol. 11, Budapest, Hungary, June 16-20, 1970, Akademiai Kiado, Budapest, Hungary, (p. 191-195) 454p.

SOILS; METALS; HUMIC ACID; DECOMPOSITION; MICROORGANISMS

259
Organic Chemicals in the Soil Environment, (Vol. 1)

Goring, C.A.; Hamaker, J.W.

Part of Goring, C.A.; Hamaker, J.W. (Eds.), Organic Chemicals in the Soil Environment, Vol. 1, Mariel Dekker, Inc., New York, NY, 440 p.; 1972

ORGANIC CHEMICALS; SOILS

260
Considerations Preliminary to Development of a Waste Pesticide Management System

Goulding, R.L.

U.S. Gov. Res. Develop. Rep. 71(3), 40-41 PB-195 982; 1971

WASTE; TRANSPORT; ACCUMULATION; DISPOSAL; PESTICIDES

261
Circulation of Elements Between Vegetation and Soil in Pine Forests and in Larch Forests in the Karelian Isthmus

Govorenko, B.F.

Sb. Tr., Tsent. Muz. Pochvoved. (STPDA9) 5, 103-130; 1972

TRACE ELEMENTS; NUTRIENTS; PINES; LARCH; FORESTS; SOILS; CYCLING; LITTER

262
Solutions to Problems of Soil Pollution by Agricultural Chemicals.

Graham-Bryce, I.J.; Rothamsted Exp. Sta., Harpenden, Herts., England

Part of Barrekette, E.S. (Ed.), Pollution: Engineering and Scientific Solutions, Plenum Press, New York-London (p. 133-147); 1973

SOILS; AGRICULTURAL CHEMICALS; HERBICIDES; ORGANOCHLORINES; METALS; FERTILIZERS; DEGRADATION; SOILS; DECONTAMINATION; ADSORBENTS

The problem of soil pollution by agricultural chemicals primarily involves persistent chemicals like the organochlorines and heavy metals, but some herbicides and fertilizers can also contribute. In general, chemicals are more readily evaporated and photochemically degraded when they are on the soil surface than when incorporated into the soil. Cultivation as a means of decontamination should be limited to soils with incorporated chemical. Addition of adsorbents such as activated carbon may have some occasional usefulness when large quantities of herbicide are required for non-recurrent control of a resistant weed. Increasing general microbial activity by the addition of sugars or various composts or by raising the temperature or maintaining a moist condition is one of the best ways to accelerate biological degradation. Replacement of persistent chemicals by alternative methods of pest control or by less persistent, more specific chemicals is frequently a better approach than employing the above mentioned methods for decontamination of the soil. Care must be exercised, however, in the introduction of biological controls as well. More efficient use of pesticides can be accomplished by application only to the target site, use of granular rather than emulsion formulations, microencapsulation, and exploitation of insect behavior. (45 references)

263
Effect of Zinc Metallurgy on Soils

Greszta, J.; Godzik, S.; Laboratory of Post-industrial Lands Reclamation, Research Institute for Upper Silesian Industrial Area, Polish Academy of Science, Zabrze

Roczniki Gleboznawcze, 20(1), 195-215; 1969

SOILS; ZINC METALLURGY; INDUSTRY; SULFUR; ZINC; LEAD; CADMIUM; MANGANESE; IRON; PLANTS; CONCENTRATION; AIR

The effect of industrial air pollutants on soils in the vicinity of a zinc metallurgy factory was studied. Besides sulphur compounds, the measurements comprised: zinc, lead, cadmium, manganese, iron and others. Moreover, a number of chemical determination in the soil samples taken at 16 points around the factory were carried out. From these points mentioned, mean soil samples for analyses were taken from 4 different depths and in nine cases--from 2 depths. The first 7 soil profiles have been made in the direction of prevailing winds. The nearest soil profile was set up at the distance of about 200 meters, the farthest--at the distance of 7.5 kilometers from the factory fencing. It has been stated that the highest zinc, lead and cadmium concentration occurs in upper soil layer (0-10 centimeter). At the depth of 11-20 centimeters much less amounts of the above elements have been observed. With the depth increase a decrease of amount of the elements investigated occurs. At the depth of 100 centimeters the amount of these elements investigated occurs. At the depth of 100 centimeters the amount of these elements approximates that in non-contaminated soils. In the zone where total plant cover destruction took place (to about 600-800 meters from the factory was distinctly less than that in the soil profiles at the distance of 200 or 600 meters from the factory. In both latter points the amounts of the determined elements approximated each other. With distance increase (over 600 meters) their content distinct decrease. It has been stated that the pollutants falling down upon the soil (particularly those of zinc, lead and cadmium) do not migrate into deeper soil profile layers, what gives evidence of their little mobility. The reaction of the soils investigated approximated the neutral one, at which pH of the surface soil layers (particularly at nearer distances from the factory) was higher than that of the deeper layers. It shows that the soil was alkalized by dustfall and that the influence of acid contaminants (e.g., sulfur dioxide) was less than it has been supposed. The plant cover destruction in the vicinity of zinc metallurgy factories is connected mainly with the presence of excessive zinc and lead amount, at simultaneous occurrence of the other trace elements, such as copper or cadmium, and not of sulphur compounds emission. This is corroborated also by the fact that in the vicinity of big power stations, where the amounts of the emitted sulphur compounds are even more higher, plants are growing.

264
Role of Montmorillonite Minerals in the Precipitation of Beryllium from Waters

Grigor'ev, N.A.; Aizikovich, A.N.; Inst. Geol. Geokhim., Sverdlovsk, USSR

Geokhimiya (GEOKAQ), (7), 1099-102; 1973

MONTMORILLONITE; BEIDELLITE; BERYLLIUM; WATER; PRECIPITATION

265
The Adsorption of Mn, Cu and Zn by Geothite From Dilute Solutions

Grimme, H.

Z. Pflernahr. Bodenk., 121, 58-65; 1968

MANGANESE; COBALT; ZINC; COPPER; IRON; TRACE ELEMENTS; ADSORPTION; HAEMATITE; AMORPHOUS; FERRIC OXIDE; PH; HYDROXIDES; GOETHITE; ION EXCHANGE; PROTONS

On shaking synthetic goethite with trace-element containing KNO_3 solution, adsorption of the cations at a given pH increased in the order (pH values at which adsorption started are given in brackets): manganese (pH 5) less than cobalt (pH 4.6) less than zinc (pH 4) less than copper (pH 3); thus, at pH 5, adsorption of manganese was 2.5%, cobalt was 7%, zinc was 13%, and copper was 78%. There was a close linear relationship between the pH value at which a given amount of cation was adsorbed and the negative logarithm of the solubility products of the respective hydroxides. In contrast to ion exchange by other clay minerals, exchange by goethite occurred between protons of the positively charged inner part of the electric double layer and metal cations in the solution; one proton exchanged for about one divalent cation. It is suggested that trace elements are concentrated in Fe-oxides of soils by first becoming adsorbed on the surface and then being occluded and irreversibly fixed when the oxide particle grows. Haematite and amorphous Fe-oxide behaved essentially in the same way as goethite.

266
Hydrocarbons in Human Environment. Part 9. Content of Polycyclic Hydrocarbons in Iceland Soil

Grimmer, G.; Jacob, J.; Hildebrandt, A.

Z. Krebsforsch Klin Onkol, 78(1), 65-72; 1972

PLANTS; SOILS; HYDROCARBONS; HUMANS; POLYCYCLIC HYDROCARBONS; HYDROCARBONS

267
Effect of Main Soil Properties on Zinc Chemical Status

Gromova, E.A.; USSR

Agrokhimiya(AGKYAU) 1973, (1) 147-53; 1973

REVIEW; ZINC; SOILS; CHELATES; FERTILIZERS

268
Geologic Aspects of Waste Solids and Marine Waste Deposits, New-York Metropolitan Region

Gross, M.G.

Geol. Soc. Am. Bull., 83(11), 3163-3176; 1972

CARBON; COPPER; SILVER; LEAD; GEOLOGY; MARINE DISPOSAL; SOLID WASTES; INDUSTRIAL WASTES

269
Extraction of 3 Amino-1, 2, 4 Triazole (Amitrole) and 2, 6-Dichloro-4-nitro Aniline from Soils

Groves, K.; Chough, K.S.; Agricultureal Chemistry Department, Washington State University, Pullman, Wa

J. Agric. Food. Chem., 19(5), 1971, 840-841

DCNA; SOILS; AMITROLE; TRIAZOLE; HEXANE

The recoveries of amitorle from non-sterile soil 1 and 17 days after application were 36.7 and 3.2% and 96.6 and 15.2% with water and a NH_4OH-glycol (5+20) mixture, respectively. Corresponding figures for sterile soil were 49.6 and 36.9% and 97.3 and 67.7%. A in HCl-acetone-glycol (1 plus 1 plus 8) mixutre was much better than hexane for the extraction of DCNA from soils.

270
Microbial Degradation of Organic Pollutants of Industrial Origin

Gunner, H.B.

U.S. Gov Res Develop Rep, 71(3), 1971, 40-41
PB-195 982

DIAZINON; INSECTICIDES; INDUSTRY; DEGRADATION

271
Influence of Various Organic Materials on the Recovery of Molybdenum and Copper Added to a Sandy Clay Loam Soil

Gupta, U.C.

Plant Soil, 34(1), 1971, 249-253

PEAT; FARMYARD MANURE; MANURE; SOILS; CLAY; SAND; MOLYBDENUM; COPPER; SANDY CLAY; LOAM

272
The Relationship of Soil Properties to Exchangeable and Water-Soluble Copper and Molybdenum Status in Podzol Soils in Eastern Canada

Gupta, U.C.; Mackay, D.C.

Soil Sci. Soc. Amer. Proc., 30, 373-375; 1966

SOILS; WATER; COPPER; MOLYBDENUM; PODZOL

273
Detailed Characterization of Soil and Vegetation on Selected Sites to Serve as Basis for Future Evaluation of Effect of Radioactive Contamination

Haghiri, F.; Ohio Agricultural Research and Development Center, Wooster

Technical Progress Report, March 1, 1969--November 26, 1969, 73 p.; 1969

AGRICULTURE; SOILS; STRONTIUM 90; CROPS; PESTICIDES; TRANSPORT; CALCIUM OXIDES; LIME; HERBICIDES; ABSORPTION; LEACHING; METABOLISM; PLANTS; WATER; RETENTION

The movement of Sr 90 in the soil profile and the removal of Sr 90 by runoff, leachate, and plants uptake as influenced by soil and crop management practices are presented. Over a 7 yyear period, the net rate of Sr 90 loss from 0 to 4 inch depth by various processes was maximum under gravel mulch and minimum under permanent grass cropping systems. The distribution of Sr 90 in the top 12 inches of soil profile was influenced by cropping system and liming. The concentration of Sr 90 at 3 to 12 inch depth under gravel mulch was approximately 10 times higher than permanent grass system. The application of high rates of lime reduced the downward movement of Sr 90. The percent of the initial application of Sr 90 removed by runoff decreased while its loss by leachate increased during the 7 year period. The distribution of Sr 90 in various part of the winter wheat plant during 1968 to 1969 was 65% in straw, 27% in chaff, and 8% in grain. The distribution of Sr 90 in corn fodder was 99% while in shelled corn it was 1% of the total Sr 90 taken up by the corn plant. The total percent Sr 90 removed by runoff, leachate, and plant uptake after a 7 year period was 16,407, 13,655, 12,481, 10,828, and 9,231 for gravel mulch, rotation a (low lime), continuous corn, rotation b (high lime), and permanent grass respectively. The effects of various rates of fenac, benzac, trifluralin, CIPC, Pyramin, and diquat herbicides on the absorption of Sr 90 by soil were studied. Among these herbicides, diquat was the most effect in releasing from soil or reducing the adsorption of Sr 90 by soil. Its effect was more pronounced under low than high pH soil. High rates of lime had a depressing effect on the removal of Sr 90-Y 90 by leaching with water in the presence of paraquat herbicide. Paraquat appears to be most effective in replacing strontium ion in acid soils with low clay and low organic matter contents. The two soils (Dunbar and Lynchburg), furnished by the USDA, were treated with Sr++ and the retention of Sr++ was compared to other soils. The curves for the adsorption and displacement of Sr 90 was similar to the soils used in previous experiments and reported in earlier reports. The non-displaceable Sr was approximately 30% of the total adsorbed. Soil samples were analyzed for boron content after the samples were methylated at various rates of BF3-MeOH. The boron content of the samples increased with increasing rates of BF3. Therefore, methylation of soil organic matter with the BF3 method is of a limited value in soil's work. It would be of value in soil organic matter fractions that contain compounds that are not reactive with BF3, for example fatty acids. The sample of runoff water from micro-plots was electrodialyzed and Sr 90 was detected in the anode chamber. The sample is being fractionated for IR and gas chromatographic analyses. The distribution of Sr 90 from soybean and corn tissue in soil columns was determined. The least movement was in the muck soil column and the most movement in the Wooster soil column. There were no conclusive differences between the tissues. (Auth)

274
Significance of pH and Chloride Concentration on Behavior of Heavy Metal Pollutants: Mercury (II), Cadmium (II), Zinc(II), and Lead(II)

Hahne, H.C.H.; Kroontje, W.

J. Environ. Quality, 2, 444-450; 1973

PH; CHLORIDES; MERCURY; CADMIUM; ZINC; LEAD; HEAVY METALS

275
The Simultaneous Effect of pH and Chloride Concentrations Upon Mercury 2 as a Pollutant

Hahne, H.C.H.; Kroontje, W.

Soil Sci. Soc. Am. Proc, 37(6), 838-843; 1973

ACID MINE DRAINAGE; RIVERS; SEA; WATER; SOILS; CLAY; MINERALS; ADSORPTION; MOVEMENT; CHLORIDES; PH; MERCURY

276
Some Chemical Principles of Groundwater Pollution

Hall, E.S.

Ground Water Pollution Conf., 105-124

ADSORPTION; BIOCONVERSION; DECOMPOSITION; DEGRADATION; FERROUS METALS; HEAVY METALS; OXIDATION; PHOSPHORUS; PHOSPHATES; SOILS; UNDERGROUND AQUIFERS; WATER; AQUIFERS; GROUNDWATER

Oxidation-reduction reactions for nitrogen compounds and iron sulphide, adsorption of organics metals and salts during the movement of a pollution front through an aquifer rock are discussed.

277
Electrophoresis Patterns of Needle Enzymes in Longleaf and Sonderegger Pines

Hamaker, J.M.; Synder, E.B.;

U.S. for Serv. Res. Note SO, 151, 1-8; 1973

ELECTROPHORESIS; NEEDLE ENZYMES; SONDEREGGER PINE; PINES; TREES; ISOZYMES; LONGLEAF PINE

278
Adsorption

Hamaker, J.W.; Thomposon, J.M.

Part of Goring, C.A.; Hamaker, J.W. (Eds.), Organic Chemicals in the Soil Environment, Vol. 1, Marcel Dekker, Inc., New York, NY, (p. 49-143) 440 p.; 1972

ADSORPTION; SOILS

279

Hydrogeological Problems in the Mining of Unbalanced Reserves of Deposits of Nonferrous Metal Ores by Biological Leaching

Hanzlik, J.; Horn. Ustav. Cesk. Akad. Ved, Prague, Czech.

Acta Mont. (ACMTCI), No. 21, 5-23; 1972

REVIEW; COPPER; LEACHING; HYDROGEOLOGY; MINING; NONFERROUS ORES; ORE

280

Agricultural Research Impact on Environment

Hargrove, T.R.

Iowa Agric. Home Econ. Exp. Stn. Spec. Rep. 69, 7-84; 1972

SOILS; EROSION; PESTICIDES; NUTRIENTS; ENRICHMENT; LIVESTOCK; WASTES; AGRICULTURE

281

Mercury Investigations 1966-1970. Mercury in Fish, Water and Sediment

Hasselrot, T.B.; The National Swedish Environment Protection Board, Research Laboratory, Drottning KRISTINAS Vag 47, 114-28 Stockholm, Sweden

SNV PM-239 ULV (parts 1 and 2), 781 p.; 1972, October 1

MERCURY; SEDIMENTS; LAKES; RIVERS; WATER; FISH; PIKE; BLACK-LISTED AREAS; SAMPLING; NEUTRON ACTIVATION ANALYSIS; ATOMIC ABSORPTION SPECTROPHOTOMETRY; METHYLMERCURY; INTAKE; CAGED FISH EXPOSURE; SALMON FRY; RAINBOW TROUT; FRESHWATER; SEA WATER; BLOOD; HEMATOCRITE VALUE; MUSCLES; LIVER; SAMPLE HOMOGENIZATION; PH; DISSOLVED OXYGEN; CONDUCTIVITY; SALINITY; WATER HARDNESS; HEAVY METALS; COLOR; CONCENTRATION; PULP MILLS; PAPER MILLS; WASTEWATER; CHLOR-ALKALI PLANTS; MINES; ELECTRICAL EQUIPMENT; PHENOXYETHYLMERCURIC CHLORIDE; PHENYLMERCURIC ACETATE; CORN; SEED DRESSING STATIONS; MERCURY DISCHARGES; DREDGING SPOILS; SEWAGE

The mercury contained in the top 3 cm of bottom sediments in 51 Swedish black-listed areas was for 47 percent less than 500 nanograms per gram; for 3.9 percent 10-50,000 nanograms per gram and for 2.0 percent greater than 50,000 nanograms per gram. Sediments from non-contaminated areas gave much lower values: 23 nanograms per gram, mountain areas in north; 95 nanograms per gram, remaining north; 157 nanograms per gram, central part; 159 nanograms per gram, south; 43 nanograms per gram, Baltic mean; 115 nanograms per gram, northern west sea coast; Stockholm archipelago; 1440 nanograms per gram, inner part, 203 nanograms per gram, outer part. Other concentration of mercury are given: 30-81 nanograms per gram for cultivated soil; 60 nanograms pergram, mean value of earth's crust; 10 nanograms per gram, Swedish bed rocks. Usually there was an obvious relationship to the high values found; pulp and papers mills, other cellulose industry, chlor-alkali plants, certain mining industries (31%), electrical apparatus (rectifiers) and chemical plants manufacturing seed dressings, slimicides, vinyl chloride (mercury catalyst), and other products (refined mercury, phosphate fertilizer, etc.) Stations for dressing seeds had small unimportant losses. Although there was a very large variation in the mercury concentration in the surface sediments in the 51 areas, there was no correlation between the values and the mercury content of fish caught in these areas (correlation coefficient-0.08). Likewise, there was no correlation between the mercury content of the sediments and organic matter, pH, hardness, iron content, etc. Usually the mercury content of the surface sediments was apprecially hgiher than that of deeper sediments; from 1-1.5 meters beneath the bottom surface and lower, values of tens of nanograms per gram were found. There were however, exceptions due to the mobility of the sediments. The mercury content of water was measured less often. Water samples give instantaneous values and therefore, are not representative of a good average value. Even after centrifugation, much of the mercury is attached to particles (and therefore cannot be concentrated in fish). Usually, the mercury content of water was very low (0.05-0.5 nanograms per gram) and near the limit of analysis. Some high values were found in water, eg. below a chlor-alkali plant (34.3 nanograms per grams), waste water effluents from Uppala and Gothenburg (7-15 nanograms per gram) (85 kilogram mercury per year from Gothenburg). Sewage treatment plants retained about 75 percent of the incoming mercury. Sampling and analytical procedures are given in detail, and experiments on mercury concentration in fish fry (mostly salmon) were carried out.

282

Ingested Soil as a Source of Microelements for Grazing Animals

Hasselrot, T.B.; New Zealand Department of Scientific and Industrial Research, Soil Bureau, P.B., Lower Hutt, New Zealand; New Zealand Department of Scientific and Industrial Research, Institute of Nuclear Sciences, P.B., Lower Hutt, New Zealand; Massey University, Dairy Husbandry Department, PalmerstonNorth, New Zealand

New Zealand Journal of Agricultural Res., 13(3), 503-521; 1970

SOILS; ADSORPTION; COBALT 60; MANGANESE 54; SELENIUM 75; ZINC 65; BLOOD; URINE; FECES; ANIMALS; TISSUE; ABSORPTION

The mercury contained in the top 3 cm of bottom sediments in 51 Swedish black-listed areas was for 47 percent less than 500 nanograms per gram; for 3.9 percent 10-50,000 nanograms per gram and for 2.0 percent greater than 50,000 nanograms per gram. Sediments from non-contaminated areas gave much lower values: 23 nanograms per gram, mountain areas in north; 95 nanograms per gram, remaining north; 157 nanograms per gram, central part; 159 nanograms per gram, south; 43 nanograms per gram, Baltic mean; 115 nanograms per gram, northern west sea coast; Stockholm archipelago; 1840 nanograms per gram, inner part, 203 nanograms per gram, outer part. Other concentrations of mercury are given: 30-81 nanograms per gram for cultivated soil; 60 nanograms per gram, mean value of earth's crust; 10 nanograms per gram, Swedish bed rocks. Usually there was an obvious relationship to the high values found: pulp and paper mills, other cellulose industry, chlor-alkali plants, certain mining industries (31%), electrical apparatus (rectifiers) and chemical plants manufacturing seed dressings, slimicides, vinyl chloride (mercury catalyst), and other products (refined mercury, phosphate fertilizer, etc.). Stations for dressing seeds had small unimportant losses. Although there was a very large variation in the mercury concentration in the surface sediments in the 51 areas, there was no correlation between the values and the mercury content of fish caught in these areas (correlation coefficient-0.08). Likewise, there was no correlation beteeen the mercury content of the sediments and organic matter, pH, hardness, iron content, etc. Usually the mercury content of the surface sediments was appreciably higher than that of deeper sediments: from 1-1.5 meters beneath the bottom surface and lower, values of tens of nanograms per gram were found. There were, however, exceptions due to the mobility of the sediments. The mercury content of water was measured less often. Water samples give instantaneous values and therefore, are not representative of a good average value. Even after centrifugation, much of the mercury is attached to particles (and therefore cannot be concentrated in fish). Usually, the mercury content of water was very low (0.05-0.5 nanograms per gram) and near the limit of analysis. Some high values were found in water, e.g., below a chlor-alkali plant (34.3 nanograms per grams), waste water effluents from Uppala and Gothenburg (7-15 nanograms per gram) (85 kilogram mercury per year from Gothenburg). Sewage treatment plants retained about 75 percent of the incoming mercury. Sampling and analytical procedures are given in detail, and experiments on mercury concentration in fish fry (mostly salmon) were carried out.

283

Arsenic Fixation by Soils

Hebert, J.; Boischot, P.

C.R. 225, 1179-1181; 1947

ARSENATE; CLAY; DRAINAGE WATER; WATER; LEAD; CALCIUM; SOILS

Soluble arsenates in concentrations below 10 mg/litre of As203 were rapidly fixed by clay, but with higher concentrations only 1/4 was fixed rapidly and the remainder quite slowly, so that heavy applications may pass to the drainage water. This risk applies also to the less soluble arsenates (Pb, Ca), when applied to soil with insufficient clay, especially if the soil is acid or decalcified.

284

Microbial Transformations of Arsenate and Arsenite

Heimbrook, M.E.; Morrison, S.M.

Abstr. Annu. Meet Am. Soc. Microbial. 73, 48; 1973

MICROBIOLOGY; TRANSFORMATION; ARSENIC; ARSENATE; ARSENITE

285

Accelerating the Decomposition of the Active Principles of Plant Protectants in the Soil

Heinisch, E.; Reifenstein, H.; Winkler, R.; Inst. Pflanzenschutzforsch. Kleinmachnow, Akad. Landwirtschaftswiss., Klein Machnow, E. Ger.

Arch. Pflanzenschutz(AVPZAR) 1972, 8(4) 313-21; 1972

CHLORATE; HERBICIDES; SOILS; SULFITE; SPENT LIQUICR; AGRICULTURE; NITRITE; INDUSTRY; DECOMPOSITION; DISSIPATION; REDUCTION; LINDANE; TRIAZINE; SODIUM CHLORATE; SOILS; LOAM; PERSISTENCE; PH; DECONTAMINATION; REMOVAL

Methods for accelerating the dissipation of pesticide residues from the soil generally entail assisting natural degradation and removal processes. Intensive cultivation and irrigation of a truck gardening field permitted the removal of the large quantities of lindane (3-4 times the recommended annual application rate) required for cultivating two crops a year. Calcium polysulfide has been suggested as a soil additive to promote chemical decomposition of triazine herbicides. Sodium chlorate residues have persisted at toxic levels for up to six weeks after application in loam soils. Since chlorate ion is a strong oxidizing agent in acid solution, application of a sulfite waste liquor to soil was studied for neutralization of chlorate residues. In vitro tests revealed that the chlorate-chloride reduction is highly pH-dependent and generally does not proceed to completion. The sulfite in the solution (as well as sodium nitrite, which could also be considered as a soil decontaminant because of its availability in large quantities at a low price) is broken down at a low pH, losing effectiveness. Field experiments generally confirmed the poor laboratory results with this decontamination method although these experiments have have not been completed.

286
Ion-Exchange Kinetics

Helfferich, F.; Shell Development Company, Emeryville, CA

Part of Marinsky, J.A. (Ed.), Ion Exchange, Volume 1, Dept. of Chemistry, State University of New York at Buffalo, Buffalo, NY, (p. 65-100), 424 p.; 1966

ION EXCHANGE; KINETICS; THERMODYNAMICS; IONIC THEORY

287
Part 1. Persistence of Chlorthiamid In Soil. Part 2. Influence of Chlorthiamid and Dichlobenil on Carbon Dioxide Liberation, Ammonification and Nitrification in Soil

Helweg, A.

Tidsskr. Planteavl., 76(2), 145-155; 1972

PERSISTENCE; CHLORTHIAMID; DICHLOBENIL; CARBON DIOXIDE LIBERATION; AMMONIFICATION; NITRIFICATION; HERBICIDES; PHYTOTOXICITY; SOILS

288
Chlorfenvinphos. Persistence and Influence on Nitrogen Metabolism in Soil

Helweg, A.; Statens Planteavls-Laboratorium, Lyngby, Denmark

Tidsskr. Planteavl(TPLAAV) 1972, 76(4) 519-27; 1972

CHLORFENVINPHOS; INSECTICIDES; PERSISTENCE; SOILS; AMMONIFICATION; NITRIFICATION; METABOLISM; SOIL MOISTURE

Technical chlorfenvionphos and pure alpha- and beta- isomers were incubated with sterile and non-sterile soil at 25 degrees C and 15% soil moisture. Chlorfenvionphos was much more persistent in sterile soil than in non-sterile soil and the beta-isomer was more persistent than the alpha-isomer (20% and 40% of the alpha- and beta-isomers, respectively, remained from 100 ppm technical chlorfenviophos after incubation for 170 days). Ammonification was not significantly reduced by 1000 ppm chlorfenvinphos. Nitrification was almost completely inhibited by 1000 ppm chlorfenvinphos but was not affected by 10 or 100 ppm.

289
Chemical Behavior of Mercury in Aqueous Media

Hem, J.D.

Part of Mercury in the Environment Geol. Surv. Prof. Paper 713, U.S. Govt. Printing Office, Wash. D.C., p. 19-24; 1970

MERCURY; AQUATIC ECOSYSTEMS; AQUEOUS MEDIA

290
Chemistry and Occurrence of Cadmium and Zinc in Water and Groundwater

Hem, J.D.

Water Resources Research 8(3), 661-679; 1972

OCCURRENCE; CADMIUM; ZINC; WATER; GROUND WATER

291
Copper Content in Grass and Soil Under Copper High-Tension Lines

Hemkes, O.J.; Hartmans, J.; Inst. Biol. Scheikd. Onderz. Landbouwgewassen, Wageningen, Neth.

Tijdschr. Diergeneesk. (TIDIAT) 1973, 98(9) 446-9; 1973

COPPER; GRASSES; POWER LINES; SOILS

292
Roadside Lead Contamination in the Missouri Lead Belt

Hemphill, D.D.; Marienfeld, C.J.; Reddy, R.S.; Pierce, J.O.

Arch. Environ. Health, 28(4), 190-194; 1974

VEGETATION; SOILS; HUMANS; ANIMALS; MINES; MILLS; SMELTERS; LEAD BELT; LEAD; ROADSIDE

293
Adsorption of Copper from Very Dilute Solutions by Pure Clay Minerals

Heydemann, A.

Geochim. Cosmochim. Acta., 15, 305-329; 1959

COPPER; ADSORPTION; CLAY; CLAY MINERALS

294
A Soil Zinc Survey in California

Hibbard, P.L.

Soil Sci. 49: 63-72; 1940

SOILS; ZINC

295
Lead Fixation by Soil Humic Acids

Hildebrand, E.E.; Blum, W.E.; Inst. Bodenkd. Waslenaehrungsl., Univ. Freiburg, Freiburg/Br., Germany

Naturwissenschaften (NATWAY), 61(3), 128-9; 1974

LEAD FIXATION; HUMIC ACIDS; SOILS; HUMUS; LEAD; FIXATION

296
Distribution of Arsenic in Soil Profiles After Repeated Applications of Monosodium Methanearsonate

Hiltbold, A.E.; Hajek, B.F.; Buchanan, G.A.

Weed Sci., 22(3), 272-275; 1974

HERBICIDES; MOVEMENT; LEACHING; DISTRIBUTION; ARSENIC; MONOSODIUM METHANEARSONATE

297
Fate of Zinc Phosphide and Phosphine in the Soil-Water Environment

Hilton, H.W.; Robinson, W.H.; Exp. Stn., Hawaii. Sugar Plant. Assoc., Honolulu, Hawaii

J. Agr. Food Chem.(JAFCAU) 1972, 20(6) 1209-13; 1972

ZINC PHOSPHIDE; SOILS; WATER; PHOSPHINE; HYDROLYSIS; RODENTICIDE; DECOMPOSITION; FOOD CHAINS; PESTICIDES; FATE; PHOSPHINE; CROPS; PLANTS; ZINC; ECOSYSTEMS

Factors affecting the changes of phosphide, contained in a rodenticide, to phosphine and then to phosphate are examined.

298
Chelating Ability of Soil Organic Matter

Mines, F.L.; Barber, S.A.; Purdue University, Agriculture Experimental Station, Lafayette, Indiana

Soil Science Society of American Proceedings, 21, 368-373; 1957

CHELATION; ZINC; SOILS; ORGANIC MATTER; ADSORPTION; PH; IONIC STRENGTH; REMOVAL; SANDY LOAM; LOAM

It was discovered that organic matter reacted with divalent metal ions in a manner similar to chelation reactions. Radioactive zinc was used to facilitate the adsorption measurements. Multiple regression was used to develop a prediction equation to determine the amount of zinc adsorbed as influencd by zinc added, pH, and ionic strength of the solution. Removal of organic matter by oxidation with hydrogen peroxide destroyed the ability of the soil to chelate zinc. Removal of hydrous silicates did not influencd the retention of zinc by the soil. The organic matter was fractionated into the humic and fulvic fractions. Both fractions reacted with zinc in a manner similar to the untreated soil. Methylation of the organic matter was used to determine the functional groups involved in the chelation reaction. Carboxyl groups did not appear to be important. The stability constant for the zinc soil complex was investigated by two independent methods. For a Maumee sandy loam soil at pH 7 and 2N KCl it was found to be 5.6.

299
Effect of Adjuvants on the Uptake of Benomyl from Planting Media by American Elm-D Seedlings

Hock, W.K.; Schreiber, L.R.

Plant Dis Rep 55 (11). 1971 971-974

ADJUVANTS; UPTAKE; BENOMYL; FUNGI; ELM; SEEDLINGS; ACCUMULATION; SOILS; PEAT; PERLITE; SAND

300
Chemistry of Trace Elements in Soils with Reference to Trace Element in Concentration in Plants

Hodgson, J.F.

Part of Hemphill, D.D. (Ed.), Trace Substances in Environmental Health - 3rd Annual Conference, June 24-26, 1969, University of Missouri, Columbia, Columbia, MO, (p. 45-58) 391 p.; 1970

TRACE ELEMENTS; SOILS; PLANTS; CYCLING; CHEMISTRY

301
Chemistry of the Micronutrient Elements in Soils

Hodgson, J.F.

Adv. in Agronomy 15: 119-159; 1963

MICRONUTRIENTS; SOILS; CHEMISTRY

302
Micronutrient Cation Complexes in Soil Solution: Partition Between Complexed and Uncomplexed Forms by Solvent Extraction

Hodgson, J.F.; Geering, H.R.; Norvell, W.A.

Soil Sci. Soc. and Proc. 29, 665-669; 1965

SOILS; SOLVENT EXTRACTION; MICRONUTRIENTS; CATION

303
Contributions of Fixed Charge and Mobile Complexing Agents to the Diffusion of Zinc

Hodgson, J.F.; Lindsay, W.L.; Kemper, W.D.

Soil Sci. Soc. Amer. Proc. 35(2), 241-244; 1971

ZINC; DIFFUSION; MOBILITY; COMPLEXES

304
Micronutrient Cation Complexes in Soil Solution: 2. Complexing of Zinc and Copper in Displaced Solution from Calcareous soils

Hodgson, J.F.; Lindsay, W.L.; Trierweiler, J.F.

Soil Sci. Soc. Proc. 30: 723-726; 1966

ZINC; COPPER; SOILS; MICRONUTRIENTS; CATIONS CALCAREOUS SOILS

305

Study of Arsenate Sorption on Soils. 2. Magnitude of Adsorption in Relation to Time and Amorphous Hydrated Oxides of Aluminium and Iron

Holobrady, K.; Galba, J.

Pol'nohospodarstvo, 16, 575-581; 1970

ARSENATE; SORPTION; SOILS; ADSORPTION; PH; IRON HYDROXIDES; ALUMINUM HYDROXIDES

The rate of adsorption was exponential. In slightly acid and neutral soils, the adsorption rate was increased by the presence of hydrated oxides of iron and aluminum.

306

A Study of the Sorption of Arsenates in Soils. 1. Adsorption Isotherms of Phospates and Arsenates

Holobrady, K.; Galba, J.; Chrenekova, E.; University of Agriculture, Nitra

Agriculture, 15(11), 956-963; 1969

ADSORPTION ISOTHERMS; PHOSPHATES; ARSENATE; SOILS; IONIC RADII; ALUMINUM OXIDE; IRON OXIDES; ARSENIC; PHOSPHORUS

The experimental results obtained in the given conditions by following the adsorption isotherms of phosphates and arsenates in four earths have brought us the following knowledge: 1. By comparing the course of adsorption isotherms of phosphates and arsenates it is possible to assume that the bond mechanism of arsenate anions in the soil is near to that of phosphates, the lower intensity of sorption of the arsenate anion being associated with a larger ion radius and thus with a lower concentration of the total negative charge on the surface of the arsenate anion. 2. The degree of sorption of the arsenate anion in a given earth depends on the chemical and physical nature of the substrate. Similarly as in the sorption of phosphates, from the point of view of arsenate bonding a very important component part is constituted by active isomorphic hydrated oxides of aluminum and iron, with the content of which the amount of arsenates, atsorbed by the examined earth, increases.

307

Draft Proposal under the Law Concerning Pollution of Soil

Hoogendijk Deutsch, S.V.

Waterschapbelangen, 56(18), 273-278; 1971

SOILS; SOIL CONTAMINATION ACT; REVIEW; WATER; REFUGE MANAGEMENT; SOIL CONTAMINATION; GROUND WATER; POTABLE WATER; REFUSE REMOVAL; REFUSE COLLECTION; REFUSE TRANSPORT; REFUSE; DEPOSAL; DISCHARGE; SELECTION; REPROCESS

A draft proposal concerning the Soil Contamination Act to be modified by the Government of the Netherlands is reviewed. The principal object of the improvement suggested is a body of preventive measures as applicable to soil contamination, water pollution and refuse management. The design has a preliminary character and is susceptible to adaptations and modifications. The draft is based on the following ideas: the soil should be considered as the base of human existence. It is defined as contaminated whenever its physical, chemical or biological properties have been changed by human intervention or other causes so as to become less suitable for any use, e.g., due to adverse involvement of mechanical, physical, chemical or microbiological soil features or ground water pollution. As pertinent to the soil ground water deserves special attention. In addition to its use as potable water, it has particular functions in the surrounding grounds as a solvent of plant nutrients and as a source of moisture for the surface vegetation. A draft for ground water protection designed by the Dutch Central Commission of Potable Water Provision is added. Following various provisions on refuse removal, collection and transport, guidelines are given on the actual standards of refuse deposal, discharge and selection for reprocessing.

308

Contamination of Plants and Soils by Lead Residues from Petrol Engines

Horak, O.; Huber, I.; Oesterr. Studienges. Atomenerg. G.M.B.H., Vienna, Aust.

Ber. Oesterr. Studienges. Atomenerg. (BOAEBM) 1973, (SGAE Ber. No. 2077), 27p.; 1973

LEAD; SOILS; HYDROCARBONS; AUTOMOBILE EMISSIONS; AIR; PLANTS; RESIDUES

309

Detection of Mercurial Seed Dressings in Soils and Groundwater

Horvath, A.; Deak, Z.;Schiefner, K.; Orszagos Kozegeszsegugyi Intezet, Budapest, Hungary

Egeszsegtudomany, 16(1), 53-62; 1972

MERCURY; METHOXYETHYLMERCURY CHLORIDE; SOILS; SEED DRESSINGS; HUMUS; SAND; GROUND WATER; AGALLOL; MODEL; WASHOUT; CLAY

The movement of an organic mercury seed dressing, Agallol (methoxyethylmercury choride), in soil was studied in model experiments and field tests. The model studies, carried out on 100-cm sand layers with 1 mg and 10 mg of mercury, revealed that sandy soils were not suitable for application of such compounds due to the marked washout. Field tests on a soil composed of 130 cm humus followed by a clay layer revealed maximum concentrations at the depth of introduction (45 cm), with values rapidly decreasing further down. Field tests on a soil consisting of 30 cm humus followed by sand, and groundwater level at 100 cm and depth of introduction 45 cm, showed both appreciable concentrations at the 100-cm depth and groundwater mercury contents of 24.7 mg/l. Due to the high toxicity mercury has for numerous organisms, its use should be avoided where the possibility of groundwater contamination exists.

310
An Overview of Soil/Plant/Animal Relationships with Respect to Utilization of Trace Elements

Horvath, D.J.; West Virginia University,
Morgantown, West Virginia 26506

Part of Hopps, H.C.; Cannon, H.L. (Eds.), Annals of the New York Academy of Sciences, Volume 199, Geochemical Environment in Relation to Health and Disease (p. 82-94); 1972, June 28

TRACE ELEMENTS; ALKALI DISEASE; BLIND STAGGERS; SELENIUM; DEFICIENCY; WHITE MUSCLE DISEASE; GOITER; IODINE; COBALT; SALT SICKNESS; SWAYBACK; COPPER; LEAD; CADMIUM; MOLYBDENUM; FLUORINE; DENTAL CARIES; OSTEOPOROSIS; FLUCRINE; DRINKING WATER; ATHEROSCLEROSIS; ZINC SUPPLEMENTATION; ANEMIA; IRON; MANGANESE; PH; HOMEOSTASIS; CHLOROSIS; ACCUMULATION; BIOINDICATORS LEGUMES; GRASSES; NICKEL; ZINC; LEAVES; FERTILIZERS; FLUOROSIS; CHROMIUM; FERTILIZERS; HYPERTENSION; DIETARY INTAKE; RECYCLING; SEWAGE SLUDGE; SEWAGE; HEAVY METALS; SOILS; PHOSPHORUS; DETERGENTS; COMPOST

Animal diseases occurring in parts of North America related to excesses or deficiencies of selenium, iodine, cobalt, copper and molybdenum are listed. Poisoning by copper, lead, or cadmium near mine or smelter areas is mentioned. Low pH favors the uptake from soils of aluminum, iron and manganese by plants; excess amounts of molybdenum and selenium are usually taken up under alkaline conditions, but can occur in some acid or neutral soils. Copper, arsenic and cadmium will probably stunt or kill plants before building up to concentrations toxic to animals (but some species, such as sheep are susceptible to copper). Indicator or accumulator plants are recognized for selenium, cobalt, and fluorine and in these toxic concentrations can be built up. Legumes usually accumulate more trace elements than grasses (except molybdenum). Lime and fertilizer applications affect the transfer of trace elements to plants. So far iodine and fluorine levels are the only ones that can clearly be related to man's health status (goiter, dental caries). Chromium and cadmium deserve more attention and are reviewed more extensively without a positive conclusion. Problems associated with recycling sewage sludges and garbage composts onto soils are discussed. While there is fairly heavy contamination with heavy metals, the author does not expect immediate problems due to the complexing of these metals with clays, organic matter and phosphorus and also the formation of insoluble precipitates at near neutral pH. Ultimately, he expects plant toxicity effects due to zinc and perhaps cadmium and also expects that much more than one million acres (estimated by King) will be needed.

311
Control of Geochemical Behavior of Selenium in Natural Waters by Adsorption on Hydrous Ferric Oxides

Howard, J.H.; Department of Geology, University of Georgia, Athens, Georgia 30601

Part of Hemphill, D.D. (Ed.), Trace Substances in Environmental Health-5th Annual Conference, June 29-July 1, 1971, University of Missouri-Columbia, Columbia, Missouri, (p. 485-495), 559 p.; 1972

SELENIUM; WATER; ADSORPTION; AQUATIC ECOSYSTEMS; FERRIC HYDROXIDES; CLAY; PH; GEOCHEMISTRY; SEDIMENTS; MOBILITY; SOILS; CROPS; PYRITE; GROUND WATER; SURFACE WATER; IRON SULFIDES; TRANSPORT; FORAGE; AGRICULTURE

Adsorption on hydrous ferric oxides is the most important control of selenium behavior in aerated aqueous environments. Ferric hydroxide absorbs one to two orders of magnitude more selenium trioxide per unit weight of adsorber than the clays, and can adsorb 90 to 99 percent of the selenium trixoxide from natural waters at pH 7-8. Hydrous ferric oxides are such effective adsorbers because of the large specific surface areas and because selenium trioxide is specifically adsorbed on the hydroxylated ferric surface. Quantitative considerations of selenium concentrations and surface areas of ferric hydroxide present in natural waters show that selenium trioxide will be almost totally adsorbed from surface waters, ground waters, and water in vicinity of weathering iron sulfides. Mobility of selenium is thus inhibited by adsorption and oxidized selenium must move by mass-wasting and stream-sediment transport. Such fixation of selenium in soils renders it unavailable to agricultural and forage crops.

312
Toxic Metals in Acid Soil. 2. Estimation of Plant Available Manganese

Hoyt, P.B.; Nyborg, M.

Soil Sci. Soc. Amer. Proc. 35(2), 241-244; 1971

CATION EXCHANGE; SOILS; PLANTS; MANGANESE; TOXIC METALS; ACID SOIL

313
Toxic Metals in Acid Soil. 1. Estimation of Plant Available Aluminum

Hoyt, P.B.; Nyborg, M.

Soil Sci. Soc. Amer. Proc. 35(2), 236-240; 1971

SATURATION; LIME; LIMING; ALUMINUM; SOILS; PLANTS; TOXIC METALS; ACID SOIL

314
Environmental Toxicology and Copper

Hueck, H.J.; Cent. Lab., Tno, Delft, Netherlands

Tno Nieuws (TNONA3), 1972, 27(9), 419-427; 1972

REVIEW; COPPER

A discussion and review with 40 references of environmental toxicology with special reference to the role of Copper. Copper is emphasized because it is both persistent and toxic, yet an essential micronutrient, and because Cu levels in the environment of humans has increased since 1900.

315
Wastewater Management by Disposal on the Land

Hunt, P.

Special Report No. 171, Corps of Engineers, U.S. Army, Cold Regions, Research and Engineering Lab., Hanover. NH; 1972

WASTEWATER; DISPOSAL; LAND DISPOSAL; MANAGEMENT

316
Lead, Cadmium and Vanadium Levels in Soils and Vegetation in Metropolitan Toronto Indicative of Airborne Contamination

Hutchinson, T.C.

Am. J. Bot., 58 (5 Part 2), 482; 1971

URBAN; PLANTS; SOILS; AIR; LEAD; CADMIUM; VANADIUM; VEGETATION;

317
A Study of Heavy Metal Concentrations and Distribution in River Mouth and Estuarine Samples from Around the Great Lakes

Hutchinson, T.C.; Fitchko, J.; Institute of Environmental Sciences & Engineering, Department of Botany, University of Toronto, Toronto, Canada

International Conference on Transport of Persistent Chemicals in Aquatic Ecosystems, Ottawa Canada, May 1-3, 1974, University of Ottawa, National Research Council Laboratories, National Research Council of Canada, Environment Canada, p. 4; 1974, May

MERCURY; LEAD; CADMIUM; ZINC; COPPER; NICKEL; COBALT; MANGANESE; CHROMIUM; SILVER; HEAVY METALS; INDUSTRY; SEDIMENTS; RIVERS; LAKES; ATOMIC ABSORPTION SPECTROPHOTOMETRY; ACCUMULATION

Surface and core samples of sediments have been collected in 1972 and 1973 from the mouths of rivers flowing into the Great Lakes. These samples have been analyzed by atomic absorption spectrophotometry for the metals Hg, Pb, Cd, Zn, Cu, Ni, Co, Mn, Cr and Ag. The objective of the study is to make a general comparison of the relative degree of heavy metal accumulation in sediments between the Great Lakes and to relate the patterns of accumulation to the urban-industrial activity associated with the rivers. In addition, the relationship between the types of sediments and their metal content is being assessed. This includes consideration of such factors as particle size and organic content. Striking differences have been found between lakes and between rivers within lakes. Some areas are found to be markedly contaminated by almost all metals analyzed, while for other sites contamination is by a single metal. Core sample analyses suggest something of the history of the process. Some of the river sediments, such as those from Milwaukee and Chicago, Lake Michigan and Thunder Bay, Lake Superior have patterns of metal pollution which relate to specific industrial activities and to inputs from street surface contaminants. Incorporation of metals into sediments from river waters and inputs from storm rivers will be discussed in relation to the overall data.

318
Decomposition of Thiocyanates and Cyanides by Microorganisms Isolated from Waste Waters of the Zyryanovsk Beneficiation Plant

Ilyaletdinov, A.N.; Vlasova, Z.G.; Enker, P.B.

Tr. Nauch.-Issled. Proekt. Inst. Obogashch. Rud Tsvet. Metal. (D8MMYC), No. 6, 97-102; 1971

CYANIDE: THIOCYANATES; WASTEWATER; BIODEGRADATION; BENEFICIATION PLANTS; DECOMPOSITION; MICROORGANISMS

319
Contamination of Vegetation by Tetraethyl Lead

Impens, R.

Ann. Gembloux, 77(3), 225-234; 1971

HUMANS; CATTLE; AIR; SOILS; FOODS; FORAGE; LEAD; TETRAETHYL LEAD; VEGETATION; PLANTS

320
Is Contamination of the Soil with Mercury Reflected by the Plants Grown on it

Imre, R.A.; Berencsi, G.

Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Erste Abt. Orig. Reihe B. Hyg. Praev. Med., 155 (5-6), 1972, 482-487

CEREZAN; LETTUCE; RADISHES; CARROTS; PARSLEY; MERCURY; SOILS; PLANTS

321
Soil Contamination Caused by the Use of Mercury Containing Disinfectants

Imre, R.A.; Berencsi, G.; Luzanyi, L.; Maurer, J.; Szegedi Orvostud. Egy. Koezegeszsegtani Intez., Szeged, Hungary

Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Erste Abt. Orig. Reihe B. Hyg. Praev. Med., 155 (5-6), 1972, 476-481

HIGOSAN; CEREZAN; PESTICIDES; MERCURY; DISINFECTANTS; SOILS; ADSORPTION; SEEDS

Seed grain disinfected with methoxy-ethyl-HgCl-containing preparations (Higosan and Cerezan) was used for sowing for 4 successive years. With repeated sowing, the Hg passed into the soil, provided the soil contained both bound substances and small amounts of organic material. The Hg was mainly adsorbed by the superficial crumbly layers.

322
Maneb Fungicide, its Effect on Soils and Tree Growth

Iyer, J.G.; Slayton, S.H.; Wood, W.B.

Adv. Frontiers Plant Sci., 29, 1972, 223-246

MANGANESE; ALUMINUM; FERTILITY; IRRIGATION; SOILS; TREES; FUNGICIDES; MANEB

323
Phenolic Degradation of Humic Acid

Jackson, M.P.; Swift, R.S.; Posner, A.M.; Knox, J.R.; Department of Chemistry, University of Western Australia, Nedlands, Australia

Soil Science, 114(1), 75-78; 1972

DEGRADATION; PHENOLIC DEGRADATION; HUMIC ACIDS; INTERAROMATIC BONDS; BINDING

Considerable information concerning the nature of the inter-aromatic bonds in humic acids was obtained using a phenolic degradation technique in which pehnol replaced the functional groups to give relatively simple identifiable degradation products.

324
Arsenic Sorption by Soils

Jacobs, L.W.; Syers, J.K.; Keeney, D.R.; Department of Soil Science, University of Wisconsin

Soil Sci. Soc. Amer. Proc., 34, 750-754; 1970

IRON OXIDES; ADSORPTION; ARSENIC; SOILS; SORPTION CAPACITY; OXALATE TREATMENT; PLANTS; ALUMINUM OXIDE; OXIDES; IRON; ALUMINUM; SILTY CLAY; CLAY; LOAM; SAND; SILT

Retention of arsenic against extraction by NH4OAc and Bray P-1 reagents from Wisconsin soils equilibrated with As (0, 80, and 320 micrograms arsenic per gram added as Na2HASO4) increased as the sesquioxide content increased. Similarly, the amount of arsenic sorbed from solution increased as the free Fe2O3 content of the soils increased. Removal of amorphous iron and aluminum components by treatment with oxalate eliminated or appreciably reduced the arsenic sorption capacity of the soil. Amorphous iron and aluminum components preferentially sorbed added arsenic, as evidenced by the quantitative removal of added arsenic from equilibrated soils by a single oxalate extraction and the essentially complete recovery of added arsenic by NH4F and NaOH reagents during chemical fractionation. Because arsenic released during extraction with NH4F is sorbed by soil components during the same extraction, NH4F-As is underestimated unless a correction for resorption is made.

325
A Review of the Geochemistry of Mercury and its Application to Geochemical Prospecting

James, C.H.

Imp. Coll. Sci. Technol., London, Techn. Comm. 41, p. 42; 1962

MERCURY; GEOCHEMISTRY; REVIEW; PROSPECTING; GEOCHEMICAL PROSPECTING

326
Adsorption and Fixation of Copper in Some Sandy Soils of Central Florida

Jamison, V.C.

Soil Science, 53, 287-297; 1942

GEOCHEMISTRY; ADSORPTION; FIXATION; COPPER; SOILS; PH; LEACHING; SANDOSPHATES; PH

Copper adsorption does not offer a reliable method for the determination of the exchange capacity of the sandy soils tested. The amount of adsorption depends not only on the Cu-ion concentration but also on the nature of the soil, its exchangeable acidity and other adsorbed ions. Leaching samples of Cu-treated soils with N-HCl removes less Cu than is removed with NaCl-HCl or BaCl2-HCl solutions. Acetate is more effective than chloride in the solution of Copper from soil. Much of the Cu is held in slowly soluble nonreplaceable or slowly replaceable forms. Although time may have some slight effect on fixation, the effect of drying is not significant. After all the free inorganic phosphates are leached from the soils, it appears that phosphatic groups are still attached to the organic colloids. The P retained apparently does not affect the retention of Cu in the soil. Finely divided quartz may fix Cu at pH 5.0, but the amounts are small as compared with those fixed by the natural soils. The fixation of Cu in acid soils must be due to the formation of slowly soluble organic compounds.

327
The Absorption of Arsenate Ions by CHLORELLAE

Jeanjean, R.; Gaudin, C.

C.R. Hebd. Seances. Acad. Sci. Ser. D. Sci. Nat. (Paris), 272 (1), 1971, 64-67

ABSORPTION; ARSENATE

328
The Solubility of Heavy Metal Hydroxides in Water, Sewage and Sewage Sludge: 3. The Solubility of Heavy Metals Present in Digested Sewage Sludge

Jenkins, S.H.; Cooper, J.S.

Int. J. Air Water Pollut., 8, 695-703; 1964

HEAVY METALS; HYDROXIDE; WATER; SEWAGE; SEWAGE SLUDGE

329
Atmospheric and Fluvial Flow Transport of Mercury

Jenne, E.A.

Part of Mercury in the Environment, Geol Survey Profess. Paper 713, U.S. Govt. Printing Office, 40-45; 1970

ATMOSPHERE; TRANSPORT; MERCURY: FLOW

330
Controls on Manganese, Iron, Cobalt, Nickel, Copper, and Zinc Concentrations in Soils and Water: The Significant Role of Hydrous Manganese and Iron Oxides

Jenne, E.A.; USGS, Denver, Colorado

Advan. Chem. Ser. no. 73, 337-387; 1968

CONCENTRATION; MANGANESE OXIDES; CHELATES; IONS; GEOCHEMISTRY; MANGANESE; IRON; COBALT; NICKEL; COPPER; ZINC; SOILS; WATER; IRON OXIDES; HYDROXIDES; FIXATION; HEAVY METALS; CLAY; PH; CARBONATES; PRECIPITATION; SEDIMENTS; ION EXCHANGE; CHELATION

It is proposed that the hydrous oxides of manganese and iron, in general, furnish the principal control on the fixation of cobalt, nickel, copper, and zinc (heavy metals) in soils and fresh water sediments; hydrous oxides of manganese and iron are nearly ubiquitous in clays, soils, and sediments. The common occurrence of these oxides as coatings allows the oxides to exert chemical activity far out of proportion to their total concentrations. Sorption or desorption of these heavy metals occurs in response to the following factors: (1) aqueous concentration of the metal in question; (2) aqueous concentration of other heavy metals; (3) pH, and (4) amount and strength of organic chelates and inorganic complex ion formers present in solution. Other suggested controls on the concentration of the heavy metals in soils and fresh waters are: (1) organic matter; (2) clays; (3) carbonates; and (4) precipitation as the discrete oxide or hydroxide. The available information on these controls is reviewed and found to be inadequate to explain the fixation of cobalt, nickel, copper, and zinc. 257 references.

331
Laboratory Evaluation of Selected Radioisotopes as Groundwater Tracers

Jennings, A.R.; Schroeder, M.C.; Texas A and M University, College Station, TX

Water Resour. Res., 4, 829-838; 1968, August

CERIUM 141; ANTIMONY 121; RUTHENIUM 103; CHROMIUM 31; IRIDIUM 114; STRONTIUM 89; MOVEMENT; SOILS; SOIL PROFILES; CHELATION; ILLITE; RADIOISOTOPES; GROUND WATER; WATER; FLOW; TRACER

Choice of radioisotopes for following ground-water flow is discussed. The radioisotopes used should be either in anionic or nonionic form, as cations are most susceptible to ion exchange. The choice of anionic radioisotopes for ground-water tracers is limited because of the half-life, type, and energy of the radiation emitted, and in some cases the chemical complexity of the isotope. A suitable detection time for radioisotopic tracers is from 3 to 5 half-lives. As the appearance of a tracer results from movement along the most direct flow path, the arrival of the maximum concentration is the best index for determining the average water velocity. Sb 121, Ce 141, Cr 31, Ir 114, Ru 103, and Sr 89 in chelate form were tested, as the unchelated ions are subject to greater delay by adsorption and ion exchange.
Distribution-coefficient measurements were made under static conditions for crushed illitic shale and limestone, and these measurements used to predict the elution history of a tracer from an exchange column. Comparisons of the predictions, the tracer elution histories, and elution histories for chloride pulses indicated chelated Cr 31 to be a useful ground-water tracer.

332
Biological Methylation of Mercury in Aquatic Organisms

Jensen, S.; Jernelov, A.

Nature 223: 753-754; 1969

MERCURY; METHYLMERCURY; AQUATIC ECOSYSTEMS; BIOLOGICAL METHYLATION; AQUATIC ORGANISMS

333
An X-ray Investigation of the Hydrolysis Products of Mercury(II) in Solution

Johansson, G.

Acta. Chim. Scand., 25, 2787-2798; 1971

X-RAY; HYDROLYSIS; MERCURY

334
CADMIUM ADSORPTION MAXIMA OF SOILS AS MEASURED BY THE LANGMUIR ISOTHERM

John, M.K.

CAN. J. SOIL SCI.(CJSSAR) 1972, 52(3) 343-50; 1972

CADMIUM; ADSORPTION; SOILS; ISOTHERM; LANGMUIR EQUATION; SAND; LOAM; SILT; ALUMINUM; ZINC; HUMUS

Thirty surface soils were equilibrated with four CdCl2 solutions and the agreement of the Cd adsorption data for each soil with the Langmuir equation allowed the calculation of an adsorption maximum and a constant related to the bonding energy of the soil for Cd. Adsorption maxima for all soils were similar in magnitude and were correlated with Al and Zn soluble in 0.01M CaCl2. The coefficients related to the bonding energy generally decreased in the order: organic greater than heavy clay greater than sandy and silt loam greater than sandy soils, and were correlated with total Al and Fe.

335
Cadmium Adsorption Maxima of Soils as Measured by the Langmuir Isotherm

John, M.K.

Can. J. Soil. Sci., 52 (3), 1972, 343-350

BONDING ENERGY; LINEAR REGRESSION EQUATIONS; LANGMUIR EQUATION; CADMIUM ADSORPTION; SOILS

336
Lead Availability Related to Soil Properties and Extractable Lead

John, M.K.

J. Environ. Qual., 1 (3), 1972, 295-298

LACTUCA-SATIVA; AVENA-SATIVA; NICKEL; ALUMINUM; PH; CONTAMINATION; LEAD; SOILS

337
Cadmium Contamination of Soil and Its Uptake by Oats

John, M.K.; Chuah, H.H.; Van Laerhoven, C.J.; Research Station, Canada Department of Agriculture, Agassiz, British Columbia, Canada

Environmental Science and Technology, 6(6), 555-557; 1972, June

SOILS; PLANTS; ROOTS; HYPERTENSION; FOODS; FUNGICIDES; TRANSLOCATION; ABSORPTION; DISTRIBUTION; CADMIUM; CONTAMINATION; UPTAKE; OATS; ACCUMULATION; HUMANS; SMELTERS; EMPHYSEMA; CHRONIC BRONCHITIS; BODY; ANIMALS; PLANTS; ZINC; OILS; TIRES; NICKEL-CADMIUM BATTERIES; BATTERIES

The extent of cadmium contamination of soils in the Lower Fraser Valley (SW, British Columbia, Canada) was evaluated. Nitric acid-soluble cadmium in the surface samples among 33 agricultural soils averaged 0.88 ppm. However, nitric acid-soluble cadmium reached as high as 95 ppm in a surface sample taken near a battery smelter, but this level decreased considerably with distance and depth. The effect of soil application of carbonate, nitrate, chloride, sulfate, and phosphate salts of calcium on cadmium uptake by oats was determined in a growth chamber study involving soils taken near a battery smelter and from farmland. Oats grown on the contaminated soils contained very high amounts of cadmium in the roots, with smaller amounts in the above-ground portions. Soil treatments affected the cadmium content of roots significantly but did not affect the cadmium content of tops.

338
Factors Affecting Plant Uptake and Phytotoxicity of Cadmium Added to Soils

John, M.K.; Van Laerhoven, C.J.; Chuah, H.H.; Research Branch, Canada Department of Agriculture, Agassiz, B.C., Canada

Environmental Science and Technology, 6(12), 1005-1119; 1972, November

CADMIUM; CADMIUM CHLORIDE; SOILS; RADISHES; LETTUCE; AVAILABILITY; CONCENTRATION; NICKEL; IRON; ZINC; COPPER; ACCUMULATION; UPTAKE; CHLOROSIS; ATOMIC ABSORPTION SPECTROPHOTOMETRY; COLORIMETRY; PHYTOTOXICITY

For a set of 30 surface soils, addition of 50 mg of cadmium, from CdC12, to 500 grams of soil reduced yields and sharply increased cadmium levels in analyzed portions of radish and lettuce plants when compared with those plants grown on control soils. For the treated soils, plant cadmium was significantly related to cadmium extracted from soil by neutral N ammonium acetate. The N HC1 and N HNO3 extractions did not indicate plant availability but removed most of the soil dadmium. From among 18 potential independent variables, stepwise linear regressions to predict cadmium found in plant parts harvested from treated soils included a measure of the relative ability of soils to absorb cadmium, acetate-soluble cadmium in the soil, soil reaction, and organic matter as significantly contributing independent variables. Plant cadmium levels were significantly correlated with amounts of nickel, iron, zinc, and copper in the same plant portion. Results of this study indicated that the cadmium pollutant may readily be taken up from the soil and may result in potentially hazardous accumulation of cadmium in plants. Besides its effect on the cadmium levels, the treatment produced toxicity symptoms and reduced yields.

339
Trace Element Concentrations in Aerosols from the San-Francisco Bay Area

John, W.; Kaifer, R.; Rahn, K.; Wesolowski, J.J.

Atmos. Environ., 7(1), 107-118; 1973

SOIL-DERIVED OCEAN POLLUTION; SELENIUM; ZINC; MERCURY; BROMINE; IRON; SODIUM; AEROSOLS; TRACE ELEMENTS

340
Arsenic Content of Soil and Crops Following Use of Methanearsonate Herbicides

Johnson, L.R.; Hiltbold, A.E.

Proc. Soil Sci. Soc. Am., 33, 279-282; 1969

CROPS; COTTON; SOYBEANS; SORGHUM; OATS; MAIZE; VETCH; CLOVER; RATE; ARSENIC; SOILS; HERBICIDES

Much of the applied As remained in the upper 30cm of soil. The As content of crops (cotton, soybean, sorghum, oats, maize, vetch, clover) grown on treated soil was related to the rate and form of As applied, but yields were not reduced by residual As in soil.

341
The Movement of Copper, Molybdenum, and Selenium in Soils as Indicated by Radioactive Isotopes

Jones, G.B.; Belling, G.B.

Aust. J. Agric Res., 18, 733-740; 1967

COPPER; MOLYBDENUM; SELENIUM; RADIOACTIVE ISOTOPES; MOVEMENT; PEAT; CALCAREOUS SAND; TERRA ROSSA; LATERITE; SOILS; RAINFALL; SUPERPHOSPHATE; LUCERNE; SODIUM SELENITE; SAND; LEACHING

Copper 64, molybdenum 99 and selenium 75 were used to study the movement of these elements in peat, calcareous sand, terra rossa, deep sand and laterite under the influence of various fertilizer treatments. With soils of moderate CEC, copper remained near the soil surface after all fertilizer treatments and the equipment of several years' rainfall. With light soils of low CEC, some penetration of copper occurred, especially after superphosphate and on aqueous extract of lucerne. Molybdenum was leached right through the soils except in the laterites where half the molybdenum was retained near the surface. Selenium, applied as sodium selenite, was intermediate in that a high proportion was retained by the calcarious soils but not always at the surface. Lighter soils retained less selenium.

342
The Movement of Cobalt and Zinc in Soils as Indicated by Radioactive Isotopes

Jones, G.B.; Riceman, D.S.; McKenzie, J.O.; University of Adelaide, Division of Biochemistry and General Nutrition, Adelaide, Australia

Aust. J. Agr. Research, 8, 190-201; 1957

ZINC; COBALT; SOILS; MOVEMENT; ADSORPTION

A method has been developed whereby labeled cobalt and zinc were applied to the surface of columns of soil in order to study the movement of these cations under the influence of rainfall and various fertilizer treatments. The results of the investigation demonstrate that in soils of moderate exchange capacity, whether this is provided by clay or by organic matter, the cobalt and zinc remain close to the surface of the soil even after the application of water equivalent to several years' rainfall and dressings of copper sulphate, superphophate, aqueous extract of lucerne, and water saturated with carbon dioxide. With very light soils of low exchange capacity a year's rainfall alone did not leach the cobalt or zinc downwards, but rainfall which followed treatments with the same treatments with the same dressings induced a considerable downward movement of both cobalt and zinc. (CWP)

343
The Reaction of Zinc Sulfate with the Soil

Jones, H.W.; Gall, O.E.; Barnette, R.M.

Florida Agr. Expt. Stas. Gainesville. Bulletin 298; 1936

ZINC; SULFATES; SOILS; ZINC SULFATE

344
Lead in Soils of the Zenica Area

Jovandic, P.; Poljopr. Rak., Sarajevo, Yugoslavia

Agrohemija (AGHJA4), (9-12), 457-62; 1972

LEAD; SOILS

345
Thermodynamics of Zinc Adsorption on Calcite, Dolomite and Magnesite-Type Minerals

Jurinak, J.J.; Bauer, N.

Soil Sci. Soc. Am. Proc. 20: 466-471; 1956

ZINC; ADSORPTION; CALCITE; SOILS; DOLOMITE; MAGNESITE; MINERALS; THERMODYNAMICS

346
Cation Transport in Soils and Factors Affecting Soil Carbonate Solubility

Jurinak, J.J.; Lai, S.H.; Hassett, J.J.: Utah State University, Logan, UT 84322

Environmental Protection Agency Report, No. EPA-R2-73-235; 1973, May

MAGNESIUM; ION TRANSPORT; CALCIUM CARBONATE; LEACHING; CATION EXCHANGE; IRRIGATION; FLOW; MODEL; TRANSPORT; DISPLACEMENT; CATIONS; SATURATION; WATER; DOLOMITE

A predictive model of cation transport in soils undergoing miscible displacement was developed and tested. A mass balance equation was formulated to include a general nonlinear cation exchange function. The model was applied to the transport of cations through an exchanger using five types of exchange functions. The model was further tested by conducting soil column studies which involved both homovalent and heterovalent exchange. Good agreement between experimental and predicted data was obtained. Laboratory studies were also conducted to assess the affect of Mg(+2) ion on the solubility of calcareous materials. Solubility was found to vary with the surface area and mineralogy of the carbonate mineral. In waters unsaturated with respect to calcite, Mg(+2) generally increased the solubility of calcite. The presence of Mg(+2) decreased the solubility of dolomite in waters which were near saturation with respect to dolomite.

347
Zinc Solubility Under Alkaline Conditions in a Zn-Bentonite System

Jurinak, J.J.; Thorne, D.W.

Soil Sci. Soc. Am. Proc. 19: 446-448; 1955

ZINC; SOLUBILITY; BENTONITE; SOILS; ALKALINITY

348
Leaching of Certain Trace Elements From Columns of Rendzina Soil

Kabata-Pendias, A.

Pol. J. Soil Sci., 1, 103-109; 1968

LEACHING; OAK LEAVES; PINE NEEDLES; LUPIN; AMMONIUM OXALATE; WATER; ACETIC ACID; TRACE ELEMENTS; ZINC; RENDZINA SOILS; MANGANESE; COPPER; NICKEL; BORONS MOLYBDENUM; COBALT; SOILS

Tables are given for Mn, Zn, Cu Ni, Co, Mo, and B leached from soil columns by extracts of oak leaves, pine needles, and lupin and by ammonium oxalate, CO(2)-saturated water, and acetic acid solutions.

349
The Sorption of Trace Elements by Soil-Forming Minerals

Kabata-Pendias, A.

Roczniki Glebozn., 19, 55-72; 1968

HEAVY METALS; QUARTZ; ILLITE; BIOTITE; SORPTION; COPPER; COBALT; MANGANESE; NICKEL; ZINC; SOILS; TRACE ELEMENTS

Retention and release of heavy metals (Co, Cu, Mn, Ni, Zn, each added at the rate of 30 ppm) by various soil minerals (quartz, illite, biotite, etc) are shown in tables. Sorption of the metals occurred by both cation exchange and formation of complex compounds on the mineral surface. The order of metal sorption by the various minerals is discussed.

350
Notes on Chemical Methods of Determining Available Copper and Cobalt in Soils

Kabata-Pendias, A.

Pam. Pulawski, 9, 31-39; 1963

COBALT; COPPER; ADSORPTION; SOILS; CHELATION

The amounts of Cu extracted from plants and soils (peat, podzol or brown soil developed on loamy sand, sandy loam) with various extractants decreased in the order: plants (mostly clover and grass), 10 percent HCl, 0.1M EDTA, 0.1 n HCl, 2.5 percent CH3COOH, 0.1 n HNO3, CH3COOH + dithizone. The decreasing order for Co was: 10 percent HCl, EDTA, 0.1 n HCl, plants, CH3COOH + dithizone, CH3COOH, HNO3. The proportion of total Cu and Co taken up by plants was greater on mineral soil than peat, but the uptake of Co was fairly uniform.

351
Heavy Metals in Various Preparations and Fertilizers used in Agriculture

Kabata-Pendias, A.; Piotrowska, M.

Postepy Nauk Roln., 19(2), 13-29; 1972

PESTICIDES; METALS; FERTILIZERS; AGRICULTURE

352
Sorption of Manganese, Cobalt, and Copper by Peat Soils

Kanunnikova, N.A.; Khabar. Kompleksn. Nauchno-Issled. Inst., Khabarovsk, USSR

Mikroelem. Biosfere Primen. Ikh. Sel. Khoz. Med. Sib. Dal'Nego Vostoka, Dokl. Sib. Konf., 3rd (27BOAA); Filippov, V.R., Akad. Nauk SSSR, Sib. Otd., Buryat. Filial, Ulan-Ude, USSR (117-24); 1971

PEAT; SOILS; COPPER; SORPTION; COBALT; MANGANESE

353
Use of Soil Columns with Undisturbed Structure in Studies of the Capacity of Some Organic Compounds for Migration Over the Soil Profile

Kaurichev, I.S.; Ganzhara, N.P.

Dokl. Mosk. S-KH Akad. Im. K.A. Timiryazeva 154 Trans. 75-80; 1969

POLYPHENOLS; HUMIC ACID; FULVIC ACID; OXALIC ACID; GLUTAMIC ACIDS; SORPTION; SOILS

354
Adsorption of some Soil Compounds by Different Sorbents

Kaurichev, I.S.; Yashin, I.M.; USSR

Dokl. Tskha (Timiryazev. Sel'Skokhoz. Akad.) (DTSKAG) 1972, 183, 11-15; 1972

SOILS; TANNIN; CARBOXYL; CARBON; ACTIVATED CATIONITE; SORPTION; ALUMINUM OXIDE

355
Incorporation of Toxic Metal Ions of Soils into Nonionic Inert Substances

Kawazoe, A.

Japan. KOKAI(JKXXAF) 1973, 2

SOILS; HEAVY METALS; PESTICIDES; RESIDUES; REMOVAL; CARBON; MERCURY; IONS; CADMIUM; INDUSTRY; IRON; ALUMINUM; RICE; RICE PADDIES ADSORPTION; COAL POWDER

Toxic metal ions such as mercury and cadmium in soils (pesticide residues or industrial precipitates) are reacted with metals such as iron and aluminum to form inert compounds. Thus, activated coal powder (50-200 MESH), containing iron and Al, was scattered over the soil at 1-10 Kg/10 acre in rice paddies. Hg ions were adsorbed by the carbon and reacted with the iron and aluminum, forming amalgam-type alloy bonds and becoming chemically inactive.

356
The Poison Chain for Mercury in the Environment

Kazantzis, G.; Dept. Med., Middlesex Hosp. Med. School, London, W.1., England

Int. J. Environ. Stud., 1, 301-306; 1971

ORGANOMERCURIALS; MERCURY; FUNGICIDES; INDUSTRIAL EFFLUENTS; LEACHING; SOILS; WOOD PULP PROCESSING PLANTS; RICE; SEED DRESSINGS; BIRDS; FOOD CHAINS; METHYLATION

Organic mercurials, which are more toxic than inorganic salts of mercury, enter the environment as fungicides and are converted to inorganic mercury by living systems. When used as fungicides, these compounds can be leached out of soil, eventually reaching waterways, or escape from wood pulp processing plants. In Japan, agricultural uses have been limited since an average concentration of 0.1 ppm mercury was found in rice. In 1966, Sweden banned the use of mercury seed dressings because of the large numbers of birds dying of mercury poisoning. Since that time mercury levels have decreased in birds at the end of the aquatic food chain. Mercury concentration in some Swedish waters may prohibit production of edible fish for 50 or 60 years. Mutagenic and teratogenic effects of mercury have been observed at concentrations below those causing intoxication. (18 references)

357

Persistence and Reactions of 14C-Cacodylic Acid in Soils

Kearney, P.C.; Woolson, E.A.

Environ. Sci. Technol., 7(1), 47-50; 1973

CACODYLIC ACID; HYDROXYDIMETHYLARSINE OXIDE; METHYL DICHLOROARSINE; IRON; ALUMINUM; ARSENIC; WATER-SOLUBLE; CALCIUM; ALUMINUM; ARSENATE; PERSISTENCE; ARSINE; DEGRADATION; CARBON 14; VOLATILIZATION

Carbon-14-labeled cacodylic acid (hydroxydimethylarsine oxide) was prepared by reacting 14C-methyl iodide with methyl dichloroarsine. Concentrations of 1, 10, and 100 ppm of cacodylic acid were established in three soils of varying iron and aluminum content. At 2, 4, 8, 16, 24, and 32 weeks, soils were analyzed from 14C and total arsenic in the water-soluble (WS), calcium, iron, and aluminum fractions. Initially, cacodylic acid was distributed in the following fractions: water soluble grams of aluminum gram total iron, gram total calcium. After 32 weeks, the distribution was water soluble potassium, gram total iron, potassium, calcium. In contrast, inorganic arsentate (5 at) was largely present in the iron and aluminum fractions. Cacodylic acid persistence was a frunction of soil type and after 32 weeks the following amounts of 14C were recovered in each soil type by combustion: Christiana (23%), Hagerstown (53%), Lakeland (62%). A decrease in both total 14C and total arsenic occurred in all soils with time. A pungent garlic odor was detected in soils receiving 100 ppm, suggesting the production of a volatile alkyl arsine. The loss of arsenic suggests that one route of carcodylic acid loss from aerobic and anaerobic soils is by alkyl arsine volatility. Degradation under aerobic conditions also occurred by cleavage of the carbon-arsenic, persumably yielding carbon dioxide and A(SO(4))3. This degradation is presumably due to microbiological actions. (18 references)

358

Cacodylic Acid Metabolism in Soils

Kearney, P.C.; Woolson, E.A.; United States Department of Agriculture, Agricultural Research Service, Plant Science Research Division, Beltsville, Maryland 20705

Paper No. 29, Pesticide Division, 162 National ACS Meeting, Washington, D. C., September 12-17, 1971; 1971

CACODYLIC ACID; METABOLISM; SOILS; ALKYL ARSINE; MICROORGANISMS; DIMETHYL ARSINIC ACID; ARSENATE; PHYTOTOXICITY; AEROBIC; ARSENIC

The following metabolic reactions of cacodylate appears to be significant in soils. Under aerobic conditions microorganisms cleave the C-As bond to form carbon dioxide and arsenate. The arsenate then reacts with the calcium, iron and aluminum salts in soils to form essentially insoluble salts. The iron and aluminum salts exhibit a low order of phytotoxicity. Cacodylic acid also forms these calcium, aluminum and iron salts, the reactions appear to be more significant with the inorganic arsenate. Under reducing conditions, cacodylate forms alkyl arsines. Our work and the work of McBride and Wolfe suggests that the dimethylarsine may be the major evolved product from certain microorganisms. Some of the alkyl arsine generated is trapped directly in soils. This must be a stable complex, since heating the arsine treated soil overnight failed to decrease the C-14 content. The free iron oxides in soils appear to play an important role in this trapping process. It is also well known that dimethylarsine is unstable in air, forming the dimethylarsinoxide or cacodyl oxide. On further air oxidation dimethylarsinoxide is further oxidized to give the dimethylarsinic acid or cacodylic acid. Under aerobic conditions this would undergo C-As bond cleavage. These sequences of events would lend support to the theory of an arsenic cycle in nature as proposed by Frost. Recently we have attempted to trace the fate of several of these organic arsenicals in aquatic food chains involving alga, snails, daphma and fish. We have observed no biomagnification of the labeled arsenicals in these food chains, realizing the limited interpretation one can put on these simple systems.

359

Chemical Distribution and Persistence of C-14-Cacodylic Acid in Soil

Kearney, P.C.; Woolson, E.A.; United States Department of Agriculture, Agricultural Research Service, Plant Science Research Division, Beltsville, Maryland 20705

Paper No. 29, Pesticides Division, 162nd National ACS Meeting, Washington, D. C., September, 1971; 1971

CACODYLIC ACID; HERBICIDES; PESTICIDES; SOILS; DIMETHYL ARSINIC ACID; FLOODED SOILS; METABOLISM; AEROBIC; ARSENIC

The metabolism of cacodylic acid under aerobic conditions appeared to proceed through C-As cleavage as well as through a volatile arsine production. The metabolism of cacodylic acid under anaerobic conditions appeared to proceed through reduction to arsine or dimethylarsine.

360

Oxidation-Reduction Potentials of Arsenate-Arsenite Systems in Sand and Soil Mediums

Keaton, C.M.; Kardos, L.T.

Soil Sci., 50, 189-207; 1940

IRON; SOILS; ARSENICAL SPRAY RESIDUES; ARSENIC FIXATION; ARSENIC; ARSENATE; OXIDATION REDUCTION; SAND; RESIDUES

The beneficial effects of iron treatments on soils poisoned by arsenical spray residues appear to be due primarily to arsenic fixation. The total fixation was increased by oxidizing the arsenic to the arsenate form.

361

The Effect of Flooding and Aeration on the Mobility of Certain Trace Elements in Soils

Kee, N.S.; Bloomfield, C.

Plant and Soil, 16(1), 108-135; 1962

FLOODING; AERATION; TRACE ELEMENTS; SOILS

362
Solution of Some Minor Element Oxides by Decomposing Plant Materials

Kee, N.S.; Bloomfield, C.

Geochim. Cosmochim. Acta. 24, 206-25; 1961

DECOMPOSITION; PLANTS; METAL OXIDES; TRACE ELEMENTS

363
The Fate of Zinc-65 Applied to Two Soils as Zinc Sulfate and Zinc EDTA

Keefer, R.F.; Estepp, R.

Soil Sci., 112(5), 1971, 325-329.

CORN; CLAY; BINDING; FATE; ZINC; SOILS; ZINC SULFATE; ZINC EDTA

364
Keith, J.R.

LEAD; ZINC; TREES; SOILS; BRUNIZEMS; PODZOL: PLANTS; GEOCHEMICAL PROSPECTING; LOESS; ELM; MAPLE; OAK; MINING; PRAIRIES; FORESTS

In the mining area and in an adjacent area, the soils were brunizems (prairie vegetation) and gray-brown podzolic soils (deciduous forest) ans were formed from bedrock and loess. The Pb and Zn contents of plans differentiated between mining and non-mining areas. The Pb and Zn contents of all the soil horizons also differentiated between the areas. At most sampling sites in the mining area, soils were more reliable than plants for geochemical prospecting. Soil samples from areas with a thick loess cover did not indicate the presence of mineralized bodies, but elm, maple and oak trees contained anomalous amounts of Pb and Zn.

365
Distribution of Total Boron, Copper, Manganese, and Molybdenum Contents in the Profiles of Some Soil Types in the Little Plain and Its Relationship to Certain Soil Characteristics

Kereszteny, B.

Acta Agron Acad Sci Hung 22 (1-2), 1973, 115-130.

PH; ORGANIC MATTER; HUMUS; SOLUBILITY; BORON; COPPER; MANGANESE; MOLYBDENUM; SOILS

366
Lead Contamination of Environment in the Meza Valley, Lead Content of the Soil

Kerin, F.; Kerin, D.; Djuric, D.; Institute of Occupational and Radiological Health, Beograde, Yugoslavia

Int. Arch. Arbeitsmed., 29, 129-138; 1972

LEAD; SMELTERS; AEROSOLS; SOILS; PLANTS; UPTAKE; AVAILABILITY; CARROTS; TOPOGRAPHIC EFFECTS; INTEGRATED SAMPLES; PH; PARTICULATES

From 1896 the lead smelting plant in Meza valley, Slovenia, Yugoslavia, has been contaminating the environment with lead aerosols. Since 1968 a broad ecological and epidemiological study on environmental contamination and human exposure has been developed. Determination of lead in the soil represents a part of these complex investigations. On 33 sampling spots along the valley the soil and plant samples were taken every year in July and October. The results of the total lead content of the soil for 1968 and 1969 are presented, together with the data about quantitative distribution in the valley. However, investigations on adsorption coefficient (soil:plant) revealed that total lead content does not represent a reliable parameter for such calculations. Therefore authors applied for the first time determination of lead in the acetate: lactate extract of the soil. This parameter is showing in some cases a better correlation between lead in soil and underground parts of plants. It seems that determination of AL-soluble lead from the soil represents a step forward (but not definite) in the determination of absorbable part of lead. The distribution of lead aerosols on the earth's surface and factors influencing it are discussed.

367
Lead Content of Soils Along Chicago's Eisenhower and Loop-Terminal Expressways

Khan, M.A.; Coello, W.F.; Saleem, E.A.; Dep. Biol. Sci., Univ. Illinois, Chicago, Ill.

Arch. Environ. Contam. Toxicol. (AECTCV), 1(3), 209-223; 1973

LEAD; SOILS; TRAFFIC; AUTOMOBILES; HIGHWAYS

Lead levels found in soils in various seasons and at various distances along the Chicago Terminal-loop Expressway, the adjoining city streets, and the Eisenhower Expressway, show a relationship between the parameters: the lead content of the soil is directly correlated with the traffic volume which is in turn affected by the seasons. As much as 7,600 ppm and 880 ppm lead is present in soils at less than 45 and 150 feet respectively from the expressway.

368
Interaction Between the Humic Acid Fraction of Soils and Certain Metallic Cations

Khan, S.U.

Soil Sci. Soc. Am. Proc., 33, 851-854; 1969

HUMIC ACIDS; SOILS; METALLIC CATIONS; CATION

369
Metallo-Organic Complexes in Soil

Khanna, S.S.; Stevenson, F.J.

Soil Sci. 93: 298-305; 1962

SOILS; ORGANOMETALLICS; COMPLEXES

370

Supply of Trace Elements, Boron, Manganese, Molybdenum, Cobalt, Copper, Zinc, in the Soils of North Kazakhstan Region

Kharitonova, A.F.

Tr. Inst. Pochvoved. Akad. Nauk. Kaz. SSR. 18, 1970 Trans 44-48.

TRACE ELEMENTS; BORON; MANGANESE; MOLYBDENUM; COBALT; COPPER; ZINC; SOILS; ELUVIATION; ACCUMULATION

371

The Availability of Chromium, Nickel, Zinc, Cadmium, Tin, and Lead for Plants

Kick, H.; Nosbers, R.; Warnusz, J.

Part of Kanwar, J.S. (Ed.), International Symposium on Soil Fertility Evaluation, Vol. I, Indian Society of Soil Science, Indian Agricultural Research Institute, New Delhi, India, (p. 1039-1045) 1117 p.; 1971

SLUDGE; CHROMIUM; NICKEL; ZINC; CADMIUM; TIN; LEAD; PLANTS; UPTAKE

372

Degradation of Synthetic Organic Moldecules in the Biosphere. Natural, Pesticidal, and Various Other Man-Made Compounds

Kilgore, W.W.; Carlson, A.E.; Dagley, S.; Pimentel, D.; Subcommittee on Chemical Additives, National Research Council, Washington, DC

Report of Subcommittee on Chemical Additives, National Research Council, PB-218 665/8, 359; 1972

DEGRADATION; ORGANIC MOLECULES; PESTICIDES; NATURAL COMPOUNDS; BIODEGRADATION

373

Land Disposal of Liquid Sewage Sludge. 2. The Effect on Soil pH, Manganese, Zinc and Growth and Chemical Composition of Rye Secale-Cereale

King, L.D.; Morris, H.D.

J. Environ. Qual., 1 (4), 1972, 425-429

COPPER; FERTILIZERS; MICRONUTRIENTS; PH; MANGANESE; ZINC; SEWAGE SLUDGE; SOILS; RYE; CEREALS

374

Sorption of Alkaline Earth, Transition, and Heavy Metal Cations by Hydrous Oxides of Iron and Aluminum

Kinniburgh, D.G.; Syers, J.K.

Agronomy Abstracts 1973, Annual Meetings, American Society Agronomy, Las Vegas, Nev; 1973

SORPTION; HYDROXIDES; IRON; ALUMINUM; ALKALINE EARTH METALS; TRANSITION METALS; HEAVY METALS

375

Sorption and Desorption of Copper by and from Clay Minerals

Kishk, F.M.; Hassan, M.N.; Dep. Soil Water Sci., Alexandria Univ., Alexandria, UAR

Plant Soil(PLSOA2) 1973, 39(3), 497-505; 1973

CLAY; MINERALS; COPPER EXCHANGE; SORPTION; DESORPTION; COPPER; CLAY MINERALS; SOILS

376

Status of Copper in Some Calcareous and Noncalcareous Soils of Egypt

Kishk, F.M.; Hassan, M.N.; Ghanem, I.; El-Sissy, L.

Plant Soil 39(3), 487-496; 1973

MINERALS; WATER; COPPER; ACIDITY; EDTA; CLAY; CALCAREOUS SOILS; EXTRACTIBILITY

377

Mercury and Other Metals in Urban Soils

Klein, D.H.; Department of Chemistry, Hope College, Holland, MI 49423

Environmental Science and Technology, 6(6), 560-562; 1972, June

SOILS; MERCURY DISCHARGES; ATOMIC ABSORPTION SPECTROPHOTOMETRY; INDUSTRIAL EMISSIONS; ASPHALT PLANTS; MERCURY; SILVER; CALCIUM; CADMIUM; COBALT; CHROMIUM; COPPER; IRON; NICKEL; LEAD; ZINC; ASPHALTS

A suite of 264 surface soil samples, selected from a 300 square mile region which includes industrial, agricultural, and residential areas, has been analyzed for mercury and silver, calcium, cadmium, cobalt, chromium, iron, nickel, lead, and zinc. All these metals are more concentrated in industrial areas than in residential and agricultural areas. All except lead are more concentrated around the airport. An asphalt plant appears to act as a point of mercury discharge.

378

Theoretical Aspects of the Persistence of Organic Matter in Soils

Kleinhempel, D.

Part of Szegi, J. (Ed.). Proceedings of the Symposium on Soil Microbiology, Vol. 2. Budapest, Hungary. 1970, June 16-20. Akademiai Kiado: Budapest, Hungary (p. 209-213) 454; 1972

LIGNIN; POLYMER; DEGRADATION; MICROBIOLOGY; PERSISTENCE; SOILS

379
Lead, Zinc, Cadmium: Concentration in Soils and Plants

Kloke, A.; Inst. Nichtparasit. Pflanzenkr., Biol. Bundesanst., Berlin-Dahlem, Germany

Staub - Reinhalt. Luft (Stchaw), 34 (1), 18-21; 1974

REVIEW; AIRBORNE METALS; VEGETATION; LEAD; ZINC; CADMIUM; SOILS; PLANTS; AIR

380
Reactions of Organic Wastes and Soils

Knoll, K.C.

Battelle Pacific Northwest Laboratory, BNWL-860, 18; 1969, January

ADSORPTION; GEOLOGY; ION EXCHANGE; LEACHING; LEACHATES; ORGANIC WASTES; PERMEABILITY; RADIOACTIVE WASTES; SOILS; WASTE DISPOSAL; WASTES; ORGANICS

The ion exchange capacity of laboratory soil columns was not impaired by a previous dose of organics but organics could leach out previously adsorbed species from the soil column.

381
Air and Water Pollution by Cadmium, Lead and Zinc Attributed to the Largest Zinc Refinery in Japan

Kobayashi, J.

Proc. Univ. Mo. Annu. Conf. Trace Subst., Environ. Health 5, 117-128; 1972

SILKWORMS; HUMANS; PLANTS; AIR; WATER; CADMIUM; LEAD; ZINC

382
Effects of Heavy Metal (Cadmium, Lead, and Zinc) Pollution from a Smelting Plant in Annaka City, Gunma Prefecture, on Agricultural Products

Kobayashi, J.; Morii, F.; Muramoto, S.; Nakashima, S.; Inst. Agric. Biol. Sci., Okayama Univ., Kurashiki, Japan

Nippon Eiseigaku Zasshi(NEZAAQ) 1970, 25(4), 364-75; 1970

FOODS; SOILS; SMELTERS;; CADMIUM; LEAD; ZINC; HEAVY METALS; CROPS

383
Distribution of Cadmium, Lead, and Zinc Contained in Soils Polluted by a Zinc Refinery in Annaka City, Gunma Prefecture

Kobayashi, J.; Morii, F.; Muramoto, S.; Nakashima, S.; Urakami, Y. Nishizaki, H.; Okayama University, Kurashiki, Japan

Nippon Dojo-Hiryogaku Zasshi(NIDHAX), 44(12), 471-85; 1973

SOILS; METALS; CADMIUM; ZINC; LEAD; HEALTH; REFINERIES; DISTRIBUTION

384
Forms of Copper, Lead and Zinc in Soils of Certain Poly Metallic Deposits in Various Landscape Zones of the Lesser Caucasus

Kocharyan, A.G.; Elenbogen, A.M.

Vestn.Mosk. Univ. Ser. Geogr., 6, 1969, 79-82

COPPER; LEAD; ZINC; SOILS; LANDSCAPE

385
Minor Elements in Terrestrial Environment. 1. Radiochemical Analysis of Lead-210, as well as Distribution of Lead-210, Strontium-90, and Cesium-137 in Soil Profiles

Kodaira, K.; Kato, M.; Ishikawa, M.; Natl. Inst. Agric. Sci., Tokyo, Japan

Radioisotopes (RAISAB) 1973, 22(7), 331-7

LEAD; SOILS; CESIUM; STRONTIUM; RADIOACTIVITY; TERRESTRIAL ECOSYSTEM; ANALYSIS; RADIOCHEMICAL ANALYSIS; DISTRIBUTION

386
Sorption of Long-Lived Fission Products on Soils and Clay Minerals

Kokotov, Y.A.; Popova, R.F.; Urbanyok, A.P.

Radiokhimiya 3, 199-206; 1961

SOILS; CLAY; MINERALS; SORPTION; FISSION PRODUCTS

387
Technical Environmental Chemicals Occurrence Degradation and Consequences

Korte, F.; Klein, W.; Drefahl, B.

Naturwiss Rundsch 23 (11), 445-457; 1970

PERSISTENCE; PESTICIDES; INSECTICIDES; RECYCLING; ANIMALS; PLANTS; HUMANS; OCCURRENCE; DEGRADATION

388
MOVEMENT OF APPLIED ZINC IN SOILS. I. ZINC MOVEMENT AS AFFECTED BY ITS SOURCES AND GRANULATION WITH FERTILIZER SALTS

Koshino, M.

NIPPON DOJO-HIRYOGAKU ZASSHI(NIDHAX) 1973, 44(6), 217-22; 1973

ZINC; MOBILITY; SOILS; EDTA; SULFATES; RAYPLEX; FERTILIZERS; SALTS

389
Movement of Applied Zinc in Soils. 2. Movement of Zinc from Zinc Sulfate and Zinc-EDTA Applied in Different Soils

Koshino, S.; Sekizawa, M.; Natl. Inst. Agric. Sci., Tokyo, Japan

Nippon Dojo-Hiryogaku Zasshi(NIDHAX) 1973, 44(7), 257-61; 1973

ZINC; MOBILITY; SOILS; EDTA; SULFATES

390
Characterization and Quantitation of the Apo Lipo Proteins from Human Chyle Chylomicrons

Kostner, G.; Holasek, A.

Biochemistry 11 (7). 1972 1217-1223.

HUMANS; DIFFUSION; GEL; PERMEATION; ION EXCHANGE; CHROMATOGRAPHY; POLY ACRYLAMIDE GEL; ELECTROPHORESIS; IMMUNO ELECTROPHORESIS; APO-LIPO PROTEINS

391
The Three-Phase Equilibrium of Mercury in Nature

Kothny, E.L.; Air and Industrial Hygiene Laboratory, State of California Department of Public Health, 2151 Berkeley Way, Berkeley, CA 94704

Part of Kothny, E.L. (Ed.), Trace Elements in the Environment, a Symposium sponsored by the Division of Water, Air and Waste Chemistry at the 162nd Meeting of the American Chemical Society, Washington, D.C., Sept. 15, 1971, (p. 48-80), 149; 1971, September

MERCURY; EQUILIBRIUM; ATMOSPHERE; ROCKS; TRANSPIRATION; VEGETATION; DRY FALLOUT; RAINOUT; HUMUS; ALLUVIUM; BIOTA; CLAY; PELAGIC ORGANISMS; AGGLOMERATE; SEDIMENTATION; MIDOCEANIC CHAIN; PHYTOPLANKTON; ALGAE; ADSORPTION; AIR; DECOMPOSITION

Mercury levels are postulated to be the result of equilibrium between the contents in the atmosphere, particulate matter, and rocks. Mercury is released into air by outgassing of soil, transpiration and decay of vegetation, and by heating processes. Most mercury is adsorbed onto atmospheric particulate matter. This is removed from air by dry fallout and rainout. Humic material forms complexes which are adsorbed onto alluvium, and only a small soluble fraction is taken up by biota. Small clay particles and rainout particles are distributed throughout the oceans because of the slow settling speed. Pelagic organisms agglomerate the mercury-bearing clay particles, thus promoting sedimentation and acting as one source for mercury for the midoceanic chain. Another source is the uptake of dissolved mercury by phytoplankton and algae.

392
The Effect of Powerplant Waste Tips on Surrounding Areas.

Kozel, J.; Maly, V.; Research Institute for Amelioration, Zbraslav, Czechoslovakia

Scientia Agriculturae Bohemoslavaca, 4 (3), 165-190; 1972

ARSENIC; LEAD; ZINC; CHROMIUM; BERYLLIUM; NICKEL; COBALT; SOILS; CALCIUM; SULFATES; PLANTS; SULFUR; STOMATA; POWER PLANTS; INDUSTRIAL WASTE

Soils contaminated by proximity to the tips contained more Ca and sulphates and potentially toxic quantities of As, Pb, Zn, Cr, Be, Ni and Co and had worse physical conditions, particularly in relation to drainage, than uncontaminated soils. Contamination of plants near the tips caused increase in the S and ash contents and caused blocking of stomata.

393
Migration of Zinc in the Biosphere in Connection with Hydrochemical Predicting

Kozhara, V.L.; Inst. Biol. Vnutr. Vod. USSR

Mater. Soveshch. Prognozirovaniyu Soderzh. Biogennykh Elem. Org. Veshchestva Vodokhran., 127-35, Edited by Drachev, S.M., Inst. Biol Vnutr. Vod. Akad. Nauk SSSR: Borok, USSR; 1969

GEOCHEMISTRY; MIGRATION; ZINC; BIOSPHERE; HYDROCHEMICAL PREDICTING; ZINC CYCLE; DISTRIBUTION; SOILS; UTILIZATION; AIR; LIQUID WASTES

A review with 18 references of Zn cycle in nature; its distribution in verous soils, utilization by industry and humans, and its return as airborne and liquid wastes are discussed. CA 74(11), 248 (May 31, 1971)

394

Content and Profile Distribution of Trace Elements (Zinc, Copper, Nickel, and Cadmium) in Moldavian Soils

Krupenikov, I.A.; Podymov, B.P.; Strizhova, G.P.

Vopr. Issled. i Ispol'z. Pochv. Moldavii (Kishinev; Kartya Moldovenyaske) Sb., (2), 24-35; 1964

GEOCHEMISTRY; CONCENTRATION; TRACE ELEMENTS; ZINC; COPPER; NICKEL; CADMIUM; SOILS; FORESTS; CHERNOZEM; SALINITY; MIGRATION; ALLUVIAL SOIL; SODDY SOILRATION

Twenty-two profiles (to 200 centimeter depth) comprising the majority of the soil types in the republic were studied. Forest, chernozem, saline and soddy-alluvial soils were studied. The following trace element contents were found (parts per million): cadmium 9 to 23, 8 to 25, 3 to 23, and 3 to 30; nickel 10 to 29, 19 to 42, 11 to 30, and 14 to 43; zinc 18 to 49, 21 to 88, 20 to 54, and 23 to 98; respectively in gray and brown forest soils of the central part; dark-gray forest and chernozem soils from the north; chernozems in the south; and compact chernozems, soddy alluvial, and saline soils of different regions. Trace element accumulation in the upper horizons was high in chernozems, especially in leached and typical chernozems formed on derivatives of Tertiary clays. This is explained by the high trace element content in soil-forming rocks and the high absolute age of chernozems. Younger micellar ordinary carbonate and xerophyte-forest chernozems had less trace element content and their accumulation in the upper horizons was also less. A correlation was found between the trace element content (chiefly zinc and nickel) and the texture of the soil and soil-forming rocks; zinc and nickel contents were higher in thick argillaceous chernozem on original clay (41 to 53 and 14 to 30 parts per million) than in heavy loamy chernozem on loess-like loam (10 to 30 and 11 to 17 parts per million). The same correlation was not observed for copper and cadmium. More than half of the trace elements were concentrated in the silt fractions of chernozems. Characteristic features of compact chernozems are: high copper (69-81 parts per million), sometimes high cadmium (11-22 parts per million), low zinc (30 to 42 parts per million) and low nickel (14 to 21 parts per million). In gray and brown forest soils trace elements accumulated in the uppermost part of the profile and in the alluvial horizon.
Soddy-alluvial meadow soils from the southern part of Moldavia contain much more trace elements than chernozems in neighboring watershed areas; hence, the flood plain can be considered as a kind of geochemical barrier to the migration of trace elements from the dry land to the sea. The profile distribution of trace elements reflected the stratification of soddy alluvial soils.
Meadow-chernozem solonchak has a high trace element content compared with other soils. The soils are arranged in the following order in respect to trace element reserves: leached and typical chernozems greater than soddy-alluvial meadow soils greater than gray and brown forest soils greater than micellar ordinary and carbonate chernozems.

395

Effect of Adaptation of Thiobacillus Ferrooxidans to a Copper-Arsenic-Tin Concentrate on the Arsenic Leaching Rate

Kulebakin, V.G.; Laptev, S.F.

Sb. Tr., Tsent. Nauch.-Issled. Inst. Olovyan. Prom. (D8MMYC), No. 1, 75-76; 1971

ARSENIC; LEACHING; COPPER; TIN; THIOBACILLUS: FERROOXIDANS

396

Effect of Ethylenediaminetetraacetate on Mobility of Radioactive Isotopes of Strontium, Cesium and of Some Other Elements in Soil

Kulikov, N.V.; Ural. Fil. Akad. Nauk, Inst. Biol., USSR

Pochvovedenie, 6, 79-83; 1965

COBALT 60; ZINC 65; IRON; CALCIUM 45; STRONTIUM 90; RUTHENIUM 106; ZIRCONIUM 95; CESIUM 137; CHELATION; PLANT UPTAKE; ADSORPTION; SOILS; CHERNOZEM; RADIOISOTPES

In laboratory experiments with meadow chernozemic soil, Na2EDTA sharply decreased sorption of Co 60, Zn 65, Y 91 and Fe 59 by soil, decreased sorption of Ca 45, Sr 90, Zr 95 and Ru 106 to a lesser extent and did not decrease sorption of Cs 137. In a pot experiment EDTA greatly increased the concentration (dry-weight basis) of Co 60 in vetch and in the soil filtrate, possibly increased mobility of Ru 106 somewhat, but had no effect on the mobility of Sr 90 and Cs 137. Co-EDTA was stable in soil.

397

Influence of Certain Complexons on Radioisotope Sorption by Soil

Kulikov, N.V.

Tr. Inst. Ekol. Rast. Zhivotn., 61, 21-25; 1968

STRONTIUM; COBALT; ZINC; CADMIUM; CERIUM; RUTHENIUM; CALCIUM; SOILS; RADIOISOTOPES; ADSORPTION; CESIUM; CHELATION

The greatest efficiency for reducing the sorption by the soil of radioisotopes of cobalt, zinc, cadmium, cerium, and ruthenium was obtained with EDTA and DTPA, and calcium and strontium--EDBIP and DTPA. All of the chelates were ineffective for the radioisotopes of rubidium, silvers, and cesium. EDTA and DTPA are of interest for further study under growing conditions and also in field experiments with the purpose of increasing the migration capability of cobalt, zinc, cadmium, cerium, and ruthenium isotopes in more complex soil-solution-plant. (tr-Auth)

398
Movement of Chemicals in Soils by Water

Kurtz, L.T.; Melsted, S.W.; Agronomy Department, University of Illinois, Urbana, Illinois

Soil Sci., 115(3), 231-239; 1973

ADSORPTION; BIBLIOGRAPHY; CHEMICAL ANALYSIS; LEACHING; LEACHATES; REVIEW; SOILS; WATER; LANDFILLS; IONS; SALTS; MOVEMENT

Experimental methods of detection for the waterborne movement of salts and ions through soils are reviewed. The relation to the chemical and physical condition of the soils is examined.

399
Growth Injury of Crops by Heavy Metals. 2. Effect of Control of Irrigation and Drainage on Absorption of Cadmium by Rice Plant

Kusaka, S.; Ohtani, H.; Imai, T.; Zikihara, T.; Hyogo Prefect. Agric. Exp. Stn., Akashi, Japan

Chugoku Nogyo Kenkyu(CHNKAW) 1972, (44) 26-9; 1972

CADMIUM; RICE; SOILS; FLOODING; CROPS; PLANTS; UPTAKE; SOIL MOISTURE; MOISTURE

400
Geochemistry of Amino Acid Enantiomers. Gas Chromatography of Their Diastereomeric Derivatives.

Kvenvolden, K.O.; Peterson, E.; Pollock, G.E.; Ames Research Center, NASA, Moffett Field, California

Part of Advances in Organic Geochemistry, Proceedings of Fish International Meeting, Von Gaertner, H.R., (ed.). Pergamon Press, Oxford, England (387-401); 1972

AMINO ACIDS; DIASTEREOMER CHROMATOGRAPHY; SOILS; SEDIMENTS; METEORITE; GEOCHEMISTRY

401
Ecological Study of Arsenic Pollution in the Environment of an Ore Processing Plant

Laamanen, A.; Institute of Occupational Health, Helsinki, Finland

Work; Environ. Health, 9(1), 40-43; 1972

ARSENIC; ORE PROCESSING PLANTS; SMELTERS; COPPER; ORE; SOILS; INDUSTRIAL EFFLUENTS

The maximum arsenic concentrations were found 8-12 km from the copper-ore smelters.

402
An Occurrence of Naturally Lead Poisoned Soil at Kastad Near Gjovik Norway

Lag, J.R.; Hvatum, O.O.; Bolviken, B.

Nor Geol Unders (266). 1969 141-159.

OCCURRENCE; LEAD; SOILS

403
Heavy-Metal Contamination of Soils

Lagerwerff, J.V.

Part of Agriculture and the Quality of our Environment, (Brady, N.C., ed.), Am. Ass. Adv. Sci., Washingotn, 343-364; 1967

COPPER; ZINC; MANGANESE; NICKEL; ALUMINUM; MERCURY; CADMIUM; LEAD; HEAVY METALS; SOILS

Soil contamination with Cu, Zn, Mn, Ni, Al, Hg, Cd and Pb is discussed. (101 references.)

404
Lead Mercury and Cadmium as Environmental Contaminants

Lagerwerff, J.V.

Part of Mortvedt, J.J., P. M. Giordano and W.L. Lindsay (Ed.). Micronutrients in Agriculture. Proceedings of a Symposium Held at Muscle Shoals, Alabama, April 20-22, 1971. Soil Science Society of America, Inc.; Madison, Wis., U.S.A. 1972 (p. 593-636) 666p.; 1972

HEAVY METALS; LEAD; MERCURY; SOILS; CADMIUM; AGRICULTURE; MICRONUTRIENTS

405
Uptake of Cadmium, Lead, and Zinc by Radish-D from Soil and Air

Lagerwerff, V.

Soil Sci. 111 (2), 129-133; 1971

UPTAKE; CADMIUM; LEAD; ZINC; RADISH-D; ATOMIC ABSORPTION SPECTROPHOTOMETRY; TRANSLOCATION; SOILS; AIR

406
Uptake of Lead by Alfalfa and Corn From Soil and Air

Lagerwerff, J.V.; Armiger, W.H.; Specht, A.W.

Soil Sci., 115(6), 455-60; 1973

LEAD; PLANTS; SOILS; CORN; ALFALFA; PLANT UPTAKE; METABOLISM

Studies on the lead uptake by corn and alfalfa in a greenhouse revealed that the heavier pB fallout inside the greenhouse than outside was reflected by the Pb absorption in the plants. The higher deposit of Pb inseide the greenhouse was due to lead-containing. Paint wearing off the window frames. The plant parts in the lower plant section distinctly reflected increases in soil Pb content.

407
Accumulation of Cadmium, Copper, Lead and Zinc in Soil and Vegetation in the Proximity of a Smelter

Lagerwerff, J.V.; Bower, D.L.; Beirsdorf, G.T.; Agricultural Environmental Quality Institute, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland

Part of Hemphill, D.D.(Ed.), Trace Substances in Environmental Health - VI, June 13-15, 1972, University of Missouri - Columbia, Columbia, MO, (p. 71-79) 399 p.; 1972

CADMIUM; COPPER; LEAD; ZINC; SOILS; VEGETATION; SMELTERS; PLANTS; ANALYSIS; PH

Soil and plant samples were collected along northeast-southwest and northwest-southeast transects crossing at the site of a smelter, and between transects. The concentrations of Cd, Cu, Pb and Zn in soils and plants decreased with increasing distance from the smelter, indicating the possible location of the source. Analysis of the soil profile estabished a negative relationship between metal concentration and depth. This suggests an aerial origin of the contamination. Soil samples were also collected in enclosed spaces under houses (protected soil), as well as around these houses (unprotected soil). The average ratios between the metal concentrations in the 0-20 cm layers of unprotected soil and comparable metal concentrations in the protected soil are 7.0 for cadmium, 2.9 for copper, 2.0 for manganese, 2.3 for lead and 4.8 for zinc. These values serve as a general measure depicting the metal accumulation in the exposed soil. Coupled with the low pH, it indicates a deterioration of the quality of the soil in a region with a high native metal background level.

408
Exchange Adsorption of Trace Quantities of Cadmium Soils Treated with Chlorides of Aluminum, Calcium and Sodium

Lagerwerff, J.V.; Brower, D.I.

Soil Sci. Soc. Am. Proc., 36, 734-737; 1972

EXCHANGE; ADSORPTION; CADMIUM; SOILS; CHLORIDES; ALUMINUM CHLORIDES; CALCIUM CHLORIDES; SODIUM CHLORIDES

409
Exchange Adsorption or Precipitation of Lead in Soils Treated with Chorides of Aluminum, Calcium, and Sodium

Lagerwerff, J.V.; Brower, D.L.; Natl. Agric. Res. Cent., Agric Res. Serv., Beltsville, MD

Soil Sci. Soc. Amer., Proc. (SSSAA8), 37(1), 11-13; 1973

ADSORPTION; PRECIPITATION; LEAD; EXCHANGE; SOILS; CHLORIDES; ALUMINUM; CALCIUM; SODIUM

410
Contamination of Roadside Soil and Vegetation with Cadmium, Nickel, Lead, and Zinc

Lagerwerff, J.V.; Specht, A.W.

Environ. Sci. and Tech. 583-586 (July 1970); 1970

ROADSIDE; VEGETATION; CADMIUM; NICKEL; LEAD; ZINC; SOILS

411
The Transport of Cations in Soil Columns at Different Pore Velocities

Lai, S.H.; Jurinak, J.J.

Soil. Sci. Soc. Am. Proc., 36(5), 730-733; 1972

FLOW; ION CHROMATOGRAPHY; RETENTION; TRANSPORT; CATIONS; SOIL COLUMNS; PORE VELOCITIES

412
The Effect of Liming on the Adsorption and Exchange Characteristics of Trace Elements in Soils

Lakanen, E.

Acta Agric. Scand., 17, 131-139; 1967

LIMING; ADSORPTION; SOILS; PH; MANGANESE; ZINC; LEAD; NICKEL; COBALT; MOLYBDENUM; STRONTIUM; TRACE ELEMENTS

In a long-term pot experiment liming of acid soils decreased acid NH4OAc-extractable Mn, Zn, Pb, Cu, Ni, Co and Mo, and increased adsorption of Co 60, Zn 65 and Sr 89. Extractability of Co 60, Zn 65 and Sr 89 decreased at low pH and increased above pH 7.

413
Heavy Local Lead Contamination in Southern Finland. Preliminary Report

Lakanen, E.; Ervio, R.

Ann. Agric. Fenn., 10(3), 114-118; 1972

SNOW; SMELTERS; TRAFFIC; SOILS; ANALYSIS; PLANTS; LEAD

414
Selenium Accumulation in Soils and its Absorption by Plants and Animals

Lakin, H.; U.S. Geol. Surv., Denver, Colo.

Geol. Soc. Amer., Bull., 83(1), 173-81; 1972

GEOCHEMISTRY; ACCUMULATION; SOILS; ABSORPTION; PLANTS; ANIMALS

A review. Environmental Se contamination is increasing and should remain below hazardous levels.

415

Selenium in Our Environment

Lakin, H.W.; U.S. Geological Survey, Denver, CO 89225

Part of Kothney, E.L. (Ed.), Trace Elements in the Environment, a Symposium sponsored by the Division of Water, Air, and Waste Chemistry at the 162nd Meeting of the American Chemical Society, Washington, D.C., Sept. 15, 1971, American Chemical Society, Washington, D.C., (p. 96-131) 149 p.

SELENIUM; VOLCANIC EMANATIONS; METALLIC SULFIDES; BIOLOGICAL SINKS; BLACK SHALES; COAL; PETROLEUM; SELENIFEROUS BLACK SHALES; SELENIFEROUS SOILS; ANIMALS; FUELS; SOILS; VOLCANO

The primary sources of selenium are volcanic emanations and metallic sulfides associated with igenous activity. seleniumcondary sources are biological sinks in which it has accumulated. The selenium content of black shales, coal, and petroleum is 10-20 times the crustal abundance (0.05 ppm). Seleniferous black shales are the parent materials of the widespread seleniferous soils of the western plains of the United States. When burned, coal and petroleum containing selenium give rise to a redistribution of particulate selenium and SeO_2. The average selenium content of U.S. coal is about 3 ppm and of petroleum about 0.2 ppm. Selenium is an essential nutrient for animals and is required at a concentration of about 40 ppb in their diet; at concentrations of 4000 ppb and above, however, it becomes toxic to animals.

416

Fixation of Copper by Soils in the Presence of EDTA

Lal, S.; De, S.K.

J. Indian Soc. Soil Sci., 19(2), 1971, 185-188

FIXATION; COPPER; SOILS; EDTA

417

Adsorption of Copper by Soils in Aqueous Media at Different Temperatures

Lal, S.; De, S.K.; Chandra, S.; Univ. Allahabad, India

Z Pflanzenernaehr Bodenk 128 (1). 1971 54-62.; 1971

AQUEOUS MEDIA; COPPER; COPPER SULFATE; NITROGEN; CARBON; MAGNESIUM; OXYGEN; ADSORPTION; SOILS; PH; SILT LOAM;: ENDOTHERMIC REACTION; LOAM; SILT

The investigated soils (pH 6.7-7.2 and 8.5-8.6, CEC 27.2-24.5 and 26.2-20 meq/100 g, to 12-18 inches depth in the profile) showed rather high Cu^{2+} fixation from $CuSO_4$; the fixation was higher in loam than in silt loam, was an endothermic reaction accompanied by a decrease in the resultant pH, generally increased with depth, and was affected by various factors such as pH, B_2O_3, MgO and exchangeable Mg, and C/N ratio.

418

Movement and Sorption of Chemicals Applied to the Soil

Lambert, S.M.; Porter, P.E.; Schieferstein, R.E.

Weeds, 13, 185; 1965

MOVEMENT; SORPTION; SOILS

419

Dynamics of Interaction of Cations and Fulvic Acid

Langford, C.H.; Gamble, D.S.; Department of Chemistry, Carleton University, Ottawa, Ontario, Canada; Soil Research Institute, Agriculture Canada, Ottawa, Ontario, Canada

Part of International Conference on Transport of Persistent Chemicals in Aquatic Ecosystems, Ottawa, Canada, May 1-3, 1974, University of Ottawa, National Research Council Laboratories, National Research Council of Canada, Environment Canada, p. 24

METAL IONS; SEDIMENTS; TRANSPORT; FULVIC ACID; REVIEW; IONIC THEORY; BINDING; KINETICS; POLYELECTROLYTE; MODEL; LIGANDS; ANALYSIS; IRON; SPECTROSCOPY; CATIONS; IONS

Metal ions may accumulate in sediments as humic complexes. Aqueous transport involves the related soluble fulvic acid complexes. Such complexes have been speculatively designated "non-labile". Some relevant highlights of the theory of metal complex lability and binding properties of fulvic acid are reviewed. Subsequently, the first experimental study of kinetics of binding of a metal ion to a well characterized fulvic acid is reported. The metal ion is Fe(3+), the fulvic acid a polyelectrolyte of apparent mw approximately 900 with approximately 3 m eq of phenolic sites ortho to carboxyl groups per gram. The rate of binding is similar to that for the simple model ligand sulfosalicylic acid. The experiments were carried out using stopped flow kinetic spectroscopy. This technique has interesting potential application for a molecular species specific metal ion analysis scheme illustrated.

420

Controls on the Amounts of Pollutants in Subsurface Waters

Langmuir, D.

Earth and Mineral Sciences, 42(2), 9-16; 1972, November

BIOCONVERSION; DEGRADATION; GASES; GEOLOGY; LANDFILLS; LEACHING; LEACHATES; MINE SHAFTS; REVIEW; SOILS; UNDERGROUND AQUIFERS; WATER

An brief review of the scientific problems involved in a study of the pollution of underground aquifers by leachates from domestic landfill sites.

421
Adaptation of an Activated Sludge to the Purification of an Industrial Effluent

Le Ral, P.; Buatois, J.; Pany, J.; Fontanges, R.

Trib Cebedeau (Cent Belg Etud Doc Eaux Air) 26(351), 78-89; 1973

MICROFLORA; PHENOL; DIMETHYL SULFOXIDE; DEGRADATION; INDUSTRY; SLUDGE

422
Factors Affecting the Transfer of Materials Between Water and Sediments

Lee, G.F.; Water Chemistry Program, University of Wisconsin, Madison, Wisconsin

Literature Review No. 1, University of Wisconsin, Water Resources Center, Eutrophication Information Program; July 1970

WATER; SEDIMENTS; EXCHANGE REACTIONS; HYDRODYNAMICS; RATE; EXCHANGE

This paper attempts to show in a general way the factors that may be involved in various kinds of exchange reactions between waters and sediments. Basically, the exchange reactions have been broken down into physical control, where hydrodynamics plays the important part in determining the rate of exchange, and biological and chemical control, where the processes bringing the material onto or from the surface of the solid play the important role. Knowledge of exchange reactions and the factors influencing them appears to be extremely meager. In fact, it is almost impossible to make any predictions about the magnitude or rate of exchange for any species in a system that has not been investigated. Hopefully, current research in this area will help to eliminate this deficiency in knowledge within a few years.

423
Lead Pollution from a Factory Manufacturing Anti-Knock Compounds

Lee, J.A.

Nature (LOND), 238, 165-166; 1972

GROUND LAYER; BRYOPHYTES; LEAD; ANTIKNOCK COMPOUNDS; FACTORY

424
Priority of Concern Ranking System for Land Disposal of Hazardous Wastes

Lee, R.E.

Masters Thesis, University of Louisville, Speed Scientific School, Louisville, KY, 128 p.; 1972

LAND DISPOSAL; WASTES; DISPOSAL

425
Numerical Simulation of Water Quality in Coastal Waters and Estuaries

Leendertse, J.J.; Rand Corp., Santa Monica, CA

Part of 1970 IEEE International Conference on Engineering in the Ocean Environment, Digest of Technical Papers, Vol. 1, Winner, L. (Ed.), 253-4; 1970, September

WATER; WATER QUALITY; ESTUARIES; MODEL; COMPUTER SIMULATION; WASTE DISCHARGES; TIDES; DISSOLVED OXYGEN; BIOCHEMICAL OXYGEN DEMAND; SALINITY; COLIFORM BACTERIA; SEA WATER

Assessment of the influence of waste discharges in estuaries is necessary for water quality management in these waters. The model described here was developed for well-mixed estuaries and coastal seas in which salinity distributions at any point are uniform over the vertical. Well-mixed regions generally occur when considerable tidal flow exists together with a limited flow of fresh water. The dispersion of the fluid waste is caused mainly by the tidal flow, and consequently a model was developed for computation of the flow and time-varying water levels in the region which is considered. Because the tide stage influences the location of the water's edge in the tidal flats, which in turn affects the surface area of the estuary and the cross sections to a considerable extent, these functional relationships were also included in the model. The different constituents of the fluid waste can react with each other or with natural substances in the water; thus a reaction model in included. The water temperature and solar radiation influence the reaction rates, while the exchange of gases at the water surface depends on wind and waves. The functional relationships are not known exactly and must be found from the adjustment of the model using field measurements. The model is now being evaluated and adjusted for conditions in Jamaica Bay under contract with the City of New York.

426
Utilization and Disposal of Municipal, Industrial, and Agricultural Processing Wastes

Leep, R.; Traynor, M.F.; Knezek, B.D.

Progr. Rept., Mich. State Univ., Agri. Expt. Sta.; 1973

DISPOSAL; MUNICIPAL WASTES; INDUSTRIAL EFFLUENTS; AGRICULTURAL WASTES; WASTES; INDUSTRIAL WASTES

427
Reactions of Heavy Metals with Soils With Special Regard to Their Application in Sewage Waste

Leeper, G.W.

Dept of Army Corp. of Engr., Special Contract Report of Contract No. DACW73-73-c-0026, 70p.; 1972

HEAVY METALS; SOILS; SEWAGE; WASTES

428
Armeria-D on a Copper Mine in Wales and on a Zinc Lead Mine in the Pyrenees

Lefebvre, C.

Bull Soc R Bot Belg 105 (1). 1972 207-212.

METALS; TOLERANCE; MORPHOLOGY; SOILS; MINES; COPPER; ZINC; LEAD; HUMANS

429
Trace-Element Removal from Sewage Effluent by Soil Filtration

Lehman, G.S.; Wilson, L.G.; Dep. Watershed Manage., Univ. Arizona, Tucson, Ariz.

Water Resour. Res., 7(1), 90-9; 1971

TRACE ELEMENTS; WATER; SEWAGE; GEOCHEMISTRY; REMOVAL; SEWAGE EFFLUENTS; SOIL FILTRATION; GRAVEL; CONCENTRATION; IRON; MANGANESE; NICKEL; COPPER; ZINC; LEAD; CADMIUM; PERCOLATION; CALCAREOUS SOILS@(S)@SILTS; SANDS@@SILT; SAND; SILTS; SANDS; FINE GRAVEL; AEROBIC; MIGRATION; SOILS; FILTRATION

The concentrations of iron, manganese, nickel, copper, zinc, lead and cadmium in a domestic sewage effluent were effectively reduced during percolation through approximately 8 feet of material in lysimeters containing calcareous soil, mostly silt, sand, and fine gravel. Strontium concentrations were not reduced by filtration. Intermittent application of sewage is much more desirable than continuous application for trace metal filtration. Cations are immobilzed by oxidation, thus maintenance of an aerobic environment is essential for reducing trace metal translocation. CA 74 (12), 305 (1971)

430
Removal of Cations From Leachate by Interaction with Subsurface Soils

Leighton, I.W.; Blanc, F.C.; Solid Waste Management Branch Environmental Protection Agency, Boston, MA; Department of Civil Engineering, Northeastern University, Boston, MA

Boston Soc. of Civil Engineers, 60(4), 145-164; 1973

LEACHATE; LANDFILLS; SOILS; SODIUM; POTASSIUM; CALCIUM; IRON; MAGNESIUM

This investigation was conducted in order to determine the magnitude of cation removal from leachate provided by soils under a landfill. The interaction of sodium, potassium, calcium, iron, and magnesium cations in leachate with a soil was examined for eight Massachusetts soils in laboratory soil column experiements. Removal capacities for the various soil types were developed based on the soil column experiments. The removal values ranged from 3.8 milliequivalents to 31.1 milliequivalents per 100 grams of dry soil. Shaker tests were used to verify the soil column experiments.

431
Mercury in the Environment. A Global Review Including Recent Studies in the Delaware Bay Region

Lepple, F.K.; Delaware Univ., Newark. Coll. of Marine Studies

Report No. DEL-SG-8-73; Monitoring Agency Rept. No. NOAA-73040201; Contract NOAA-3-35223; 76 p.; 1973, March

REVIEW; MERCURY POISONING; MERCURY; ANALYSIS; SEDIMENTS; SOILS; COAL;: FLUX RATE; SAMPLING; WATER; ANIMALS; AIR; TOLERANCE; ATMOSPHERE; BIOSPHERE; LITHOSPHERE; HYDROSPHERE; FLUX

The first section of this two-part report reviews basic properties of mercury and its compounds as related to their effect on various facets of the environment. Among the topics discussed are the chemical forms and hazards of mercury, incidents of mercury contamination, governmental standards and tolerance limits, levels of mercury in the atmosphere, biosphere, lithosphere and hydrosphere, and the flux through each segment. The reality of the 'mercury problem' globally and locally is evaluated. A comprehensive review of the accepted methods of analyses for mercury and its compounds is also presented. The second section reports on recent studies of mercury levels in the Delaware Bay Region and compares the concentrations found in the waters and sediments to values from other areas.

432
Particulate and Soluble Agents Affecting the Relation Between Metal Toxicity and Organism Survival in the Calanoid Copepod Euchaeta Japonica

Lewis, A.G.; Whitefield, P.H.; Ramnarine, A.; Institute of Oceanography, University of British Columbia, Vancouver, B.C., Canada

Mar. Biol. (MBIOAJ), 17(3), 215-21; 1972

COPPER; DIATOMS; ASCORBIC ACID; HUMIC ACIDS; COPEPODS; CLAY; SEA WATER

Diatoms and clay mineral particles added to copper enriched seawater were effective in reducing the toxic effects of copper to E. JAPONICA. Ascorbic acid sewage effluent, and water extracts of humic acid and two types of soils were also effective in regulating the effect of trace metals in this organism. Water-soluble agents that were beneficial to survival in copper enriched water were compared with the effect of synthetic chelating agent to qualify the activity of the agents.

433
Soil Organic Matter-Metal Complexes. IV. Nature and Properties of Exchange Sites

Lewis, T.E.; Broadbent, F.E.

Soil Sci., 91, 393-399; 1961

SOILS; ORGANIC MATTER; METALS; EXCHANGE; COMPLEXES

434
Behavior of Zinc Sulfate as Foliar Applications and as Soil Applications in Some New Jersey Soils

Leyden, R.P.; Toth, S.J.

Soil Sci., 89, 223-228; 1960

SOILS; ZINC SULFATE; ZINC; SULFATES; FOLIAGE; PLANTS

435
Migration of Copper and Zinc in a Soil-Water System

Lifshits, G.M.; Abros'kina, S.A.; Stanislavskaya, T.K.; Pilevskaya, K.B.

Zap. Voronezh. Sel'skokhoz. Inst., 40, 103-11; 1969

SOILS; WATER; ORGANIC MATTER; GEOCHEMISTRY; MIGRATION; COPPER; ZINC; TRACE ELEMENTS; PH

An attempt was made to determine the character of copper and zinc migration from air-dry soil (nonroasted) and soil, roasted at 450-500 degree, and thus determine indirectly the effect of organic substance on the degree of trace elements from soil into natural waters. The extractions were made by double distilled water and quaternary formation water. The maximum extraction of copper and zinc occurred during 24 hours at 30 minute intervals between stirring. The increase in contact of soil water to 72 hours somewhat decreased the content of trace elements in extractions which was caused by adsorption-colloidal processes. The stable equilibrium was established during further exposure for less than 110 hours. This was not observed for roasted soils where copper and zinc contents remained constant. This stabilization of equilibrium was possibly caused by an absence in roasted soil of organic substance and substances promoting formation of colloids. Chemical processes, which occurred in water reservoirs and resulted in accumulation of organic substances, effected changes in redox potential in the near bottom layer promoting transfer in soluble state of some copper and zinc compounds. Decrease in extraction degree of copper and zinc by formation water with increased time was caused probably by increase in pH and total mineral content. Contents of copper and zinc in extractions from roasted soils were lower by a factor of nearly 2.

436
Environmental Levels of Radioactivity in Livermore Valley Soils

Lindeken, C.L.; Guidiksen, P.H.; Meadows, J.W.; Hamby, K.O.; Anspaugh, L.R.

Report No. CONF-730603-3; Monitoring Agnecy Rept. No. 18 16 Apr 73, 16 p.; 1973, April 16

AMERICIUM 241; BISMUTH 214; CESIUM 137; DIFFUSION; FALLOUT DEPOSITS; GAMMA SOURCES; GASEOUS WASTES; LEAD 212; NATURAL RADIOACTIVITY; POTASSIUM 40; RADIOACTIVE WASTE DISPOSAL; RADIONUCLIDE MIGRATION; STACK DISPOSAL; STRONTIUM 90; RADIATION MONITORING; SOILS; PLUTONIUM 239; PLUTONIUM 238

FOR ABSTRACT, SEE NSA 28 05, NUMBER 10871.

437
Influence of the Soil Matrix on the Availability of Trace Elements to Plants

Lindsay, W.L.

Ann. N.Y. Acad. Sci., 199, 37-45; 1972

SOIL MATRIX; PLANTS; TRACE ELEMENTS; AVAILABILITY

438
Inorganic Phase Equilibria of Micronutrients in Soils

Lindsay, W.L.

Part of in Micronutrients in Agriculture, Soil Sci. Soc. Amer., Inc., 677 South Segoe Road, Madison, Wisconsin 53711, p. 41-57; 1972

EQUILIBRIUM; MICRONUTRIENTS; SOILS

439
Equilibrium Relationships of Solid Phase Lead Compounds in Soils

Lindsay, W.L.; Department of Agronomy, Colorado State University, Fort Collins, CO 80521

Presented at the 1973 Joint Annual Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Held at Las Vegas, Nevada, November 11-16, 1973

SOLUBILITY; SOILS; LEAD; IONIC SPECIES; MOLECULAR SPECIES; LEAD COMPOUNDS; EQUILIBRIUM

A solubility diagram was developed to show the equilibrium levels of lead (2 plus) that can be maintained in soils by various lead compounds including PbO, PB3O4, PbO2, PbSO4, Pb3(PO4)2, PbCO3, PbMoO4, PbO.PbSO4, etc. The ionic and molecular species of lead in soil solutions of different pH are also considered. The effects of SO4, CO2, redox potential, and phosphate potential on lead solubility are included. Experimental studies were made in which various lead salts were reacted with soils for periods up to 30 days. Other experimental variables included soil pH, sulfate, phosphate, carbon dioxide, and redox potential. Measurements of pH, lead (2 plus), and total lead in solution were made on the solution phases. The solubility diagram was found useful in interpreting the reactions of lead in soils and pointing out the fallacies often encountered when lead reactions are considered as merely adsorption or exchange reactions.

440
The Physics-Chemical Equilibrium of Metal Chelates in Soils and Their Influence on the Availability of Micronutrient Cations

Lindsay, W.L.; Hodgson, J.F.; Norvell, W.A.

Int. Soc. Soil Sci., Trans. Comm. II, IV (Aberdeen, Scotland), (305-316); 1967

METALS; CHELATES; SOILS; AVAILABILITY; MICRONUTRIENTS; CATIONS; PHYSICAL EQUILIBRIUM; EQUILIBRIUM; CHEMICAL EQUILIBRIUM

441

Equilibrium Relationships of Zn2+, Fe3+, Ca2+, and H+ with EDTA and DTPA in Soils

Lindsay, W.L.; Norvell, W.A.

Proc. Soil Sci. Soc. Am. 33, 62-68; 1969

CHELATES; SOILS; PH; ZINC; IRON; CALCIUM; HYDROGEN IONS; EDTA; DTPA

Stability diagrams (mole-fraction diagrams) are derived for the chelates in soil when competing cations are either Fe + Ca and H or Zn + Fe + Ca and H; the diagrams show the specific metal-ligand complexes forming in the soil as well as changes in the concentration of each complex with a change in pH. Evidence is presented showing that Zn2+ reacts with amorphous SiO2 to form ZnSiCO3; this product may account for the low solubility of Zn2+ in soils (about 50 ppb and 0.005 ppb at pH 6 and 8, respectively).

442

A Theory on the Mass Transport of Previously Distributed Chemicals in a Water Saturated Sorbing Porous Medium: Isothermal Cases

Lindstrom, F.T.; Boersma, L.; Stockard, D.; Oregon State University, Corvallis

Soil Science, 112(5), 291-300; 1971

MODEL; MASS TRANSPORT; TRANSPORT; SORBTION MODEL; FREUNDLICH ISOTHERM; SURFACE CONCENTRATIONS; LANGMUIR EQUATION

Three models are considered. The first uses a special case of the Freundlich isotherm, the second a time-dependent sorbtion model (first-order kinetic type) and the third model also takes into account the changing surface concentrations.

443

Cadmium Uptake by Wheat from Sewage Sludge Used as a Plant Nutrient Source

Linnman, L.; Andersson, A.; Nilsson, K.O.; Lind, B.; Kjellstrom, T.; Friberg, L.

Arch. Environ. Health, 27(1), 45-47; 1973, July

ADSORPTION; CADMIUM; ANALYSIS; CROPS; FERTILIZER PRODUCTION; FOOD CHAINS; SEWAGE; SLUDGE TREATMENT: SOILS; WHEAT; UPTAKE; PLANTS; RESIDUE

Atomic absorption and neutron activation analysis of cadmium in wheat showed that increased levels resulted from the use of sewage sludge as a fertilizer.

444

Trace Metals in Soils, Plants, and Animals

Lisk, D.J.

Adv. in Agronomy 24, 268-325; 1972

TRACE ELEMENTS; METALS; SOILS; PLANTS; ANIMALS; REVIEW

445

A Survey of Zinc, Lead and Cadmium in Soil and Natural Vegetation Around A Smelting Complex

Little, P.; Martin, M.H.; Botany Dept., University of Bristol, Great Britain

Environmental Pollution, 3, 241-54; 1972

ZINC; LEAD; CADMIUM; SOILS; LEAVES; PLANTS; PROSPECTING; DUSTS; AIR; PARTICULATES; ATOMIC ABSORPTION SPECTROPHOTOMETRY; ELM; HAWTHORN; CONCENTRATION; UPTAKE; FOLIAR APPLICATION; SMELTERS; TREES

Analysis of samples of leaves and soil collected in the Avonmouth area of Severnside shows the distribution of airborne zinc, lead and cadmium to be strongly affected by prevailing wind conditions. Levels of zinc, lead, and cadmium in elm leaves collected in October 1971 range from 8000, 5000 and 50 parts per million dry matter respectively close to a smelting complex, to values of about 200, 100 and less than 0.25 parts per million respectively at distances of 10 to 15 kilometers from the factory. It is clear that considerable contamination of the natural vegetation has occurred, and is occurring, in this area. The authors conclude that the dust settled on the leaves and on the soil, with falling leaves and washed material from the leaves also adding to the soil. The concentration in the soil was greater in wooded areas and in the immediate surface (0 - 6 cm). Other work has shown that leaf concentrations as high as found caused reduced yield or toxicity symptoms. They explain the lack of such symptoms by the zinc and lead being in particulate form and perhaps inert. They did conclude that most of the lead remained as a superficial deposit on the leaves while some of the zinc and cadmium penetrated into the leaves.

446

Chemical and Physical Behavior of Copper in Organic Soils

Lucas, R.E.

Soil Sci., 66, 119-129; 1948

COPPER; SOILS; ORGANIC SOILS; CHEMISTRY

447

The Availability and Fixation of Copper in Swedish Soils

Lundblad, K.; Svanberg, O.; Ekman, P.

Plant & Soil 1, 277-302; 1949

AVAILABILITY; FIXATION; COPPER; SOILS

448
Some Aspects of the Determination and Distribution of Zinc

Lundergardh, P.H.

Sweden Lantbruks Hogskolans Ann. 15, 1-36; 1948

SPECTROGRAPHY; CONCENTRATION; GEOCHEMISTRY; ZINC; PLANTS; ANIMALS; ROCKS; SOILS; MIGRATION

The physiological function of Zn in plants and animals and its distribution as set forth in 80 references are discussed. The paper is a study of the abundance of Zn in the rocks and soils of Sweden. In the spectrographic method l. used, the sensitivity of the plates and the length of the exposure were adjusted to the very short life of Zn in the arc, and the carbon electrodes were protected from rapid burning. The 3345.02 A. line of Zn was measured, and a correction derived from a graph was applied to allow for the variations in this line due to the presence of K, Na, and Ca. Data of many determinations of Zn are presented from rocks and soils of Sweden selected to test certain theories about the migration of Zn. It was not found to have been increased in concentration in certain Ordovician sediments, but in these it is shown that there was precipitation of CaCo3 (and thus dilution) not as a part of organisms. But in certain other sediments made up of clay minerals drawn by the action of the roots of plants there was found the expected increase in concentration. Low concentrations of Zn were less than 100 parts per million. A greenish gray Cambrian sandy slate contained 1000 parts per million and enrichment of a sediment was implied at concentrations greater than 100 parts per million and indicated at greater than 200 parts per million. Among the crystalline rocks the Zn content was parallel to that of biotite; it was generally highest in the more recent acidic rocks and tended to be less in the older than younger rocks of similar composition. The abundance of Zn as found in these analyses is used as a basis of discussion of the mode of formation of various crystalline rocks.

449
Extractability of Added Lead in Soils and Its Concentration in Plants

MacLean, A.J.; Halstead, R.L.; Finn, B.J.

Can. J. Soil Sci., 49, 327-334; 1969

LEAD; SOILS; PLANTS; CONCENTRATION; EXTRACTABILITY

450
Amounts of Mercury in Soil of Some Golf Course Sites

MacLean, A.J.; Stone, B.; Cordukes, W.E; Soil Research Institute, Agriculture, Canada, Ottawa, Ontario

Canadian J. Soil Science, 53(1), 130-132; 1973

MERCURY; GRASSES; SOILS; LEACHING; RETENTION; SAND; LOAM; CLAY; HERBICIDES; MOVEMENT

The amounts of mercury in the turf were high near the green but decreased with distance. The degree of leaching of mercury and its retention in the subsoil layers of the different fairways was in the order of sand less than loam less than clay loam.

451
Heavy Metal Studies of Crops and Soils in Nova-Scotia

MacLean, K.S.; Langille, W.M.

Commun. Soil Sci. Plant Anal., 4(6), 495-505; 1973

VEGETABLES; LEAD; COPPER; MOLYBDENUM; ZINC; CROPS; SOILS; HEAVY METALS

452
Organochlorine Pesticides: An Introductory Bibliography

Magnolia, L.R.

TRW Systems Group, No. 99900-7467-TO-00, Redondo Beach, CA, 10 p.; 1971, March

PESTICIDES; BIBLIOGRAPHY; ORGANOCHLORINES

453
Analysis of Phenthiuram

Makarova, S.V.; Eliseeva, M.A.; Vses. Nauchno-Issled. Inst. Khim. Sredstv Zashch. Rast., Moscow, USSR

Khim. Sel. Khoz.(Kskzan) 1973, 10(9) 680-2; 1973

PHENTHIURAM; TMTD; DETERMINATION; LINDANE; COPPER; TRICHLOROPHENOLATE; SEEDS DISINFECTANTS; SEED; DISINFECTANT; GAMMA HCH; TCPC; PHOSPHORIC ACID; TETRASODIUM EDTA; CESIUM; POTASSIUM HYDROXIDE; METHYL HYDROXIDE; ABSORBTION; XANTHATE; TITRATION; IODINE; HYDROLYSIS; PETROLEUM; PETROLEUM ETHER; ETHER; DIOMETRIC DETERMINATION; COMBUSTION; RESIDUES; MINERALIZATION; CHLORINE

A method was developed for the determination of the seed disinfectant, phenthiuram, which is a mixture of TMTD, gamma-HCH, and copper 2,4,5-trichlorophenolate (TCPD). TMTD was determined after decomposition of phenthiuram, by H3PO4 in the presence of tetrasodium EDTA, to Cs2, which was absorbed in KOH/MeOH, and the generated xanthate was titrated with iodine. The gamma-HCH was determined via a preliminary extraction with petroleum ether and subsequent hydrolysis of the chlorine groups. The content of TCPC was determined via iodometric determination of the copper produced by mineralization and treatment of the combustion residue with acid.

454
Effect of Some Trace Elements on the Activity of Some Microbiological Processes in the Soil.

Maliszewska, W.; Soil Science Institute, Pulawy, Poland

Revue d'Ecologie et de Biologie du Sol, 9(3), 505-512; 1972

TRACE ELEMENTS; SOILS; MICROBIOLOGY; METALS

455
Mobility of Elements in Soil Profiles of Mont-St-Hilatre, Quebec, Canada Under Varying Slopes and Drainage Conditions

Mallick, K.A.

Nucleus (Karachi), 9(1-2), 85-96; 1972

CALCIUM; ZINC; ENRICHMENT; MOBILITY; SOIL MOISTURE; SOILS; DRAINAGE; TRACE ELEMENTS

456
Distribution of Copper and Molybdenum in the Soils, Waters, and Plants of the Kadzharan Mining District of the Armenian S.S.R.

Malyuga, D.

Trudy Biogeokhim. Lab. Akad. Nauk S.S.S.R., 11, 197-207; 1960

GEOCHEMISTRY; SEASONAL VARIATIONS; ENRICHMENT; COPPER; MOLYBDENUM; SOILS; WATER; PLANTS; ORGANIC; BIOGENIC; ACCUMULATION; MOBILITY; LEAVES; WOOD; PROSPECTING; CONCENTRATION

The molybdenum content of soils is correlated with the amount of organic substances. Molybdenum seems to act as a biogenic element. The accumulation of molybdenum in plants is directly proportional to the amount of mobile molybdenum in soil. The molybdenum content of leaves is higher than that of wood; it increases toward the second half of the summer. Prospecting for molybdenum and copper-molybdenum deposits should involve determination of molybdenum and (or) copper in soils and plants.

457
Biogeochemistry of Mercury in Soils and Plants

Malyuga, D.; Makhova, M.; Nikitina, R.

Tr. Buryat. Inst. Estestv. Nauk, Buryat. Filial, Sib. Otd. Akad. Nauk SSSR- No. 2, 190-194; 1969

MERCURY; PLANTS; QUANTITATIVE ANALYSIS; ANALYSIS; SOILS; BIOGEOCHEMISTRY

458
Dynamics of Mobile Forms of Trace Elements Copper, Manganese in Leached Mountain Chernozem

Mamyshov, M.

Tr Kaz S-Kh Inst 13 (2). 1970 Trans 121-128.

POTATO NUTRITION; FERTILIZERS; ANAEROBIC REDUCTION; SEASONAL VARIATIONS; OXIDATION; SOLUBILITY; COPPER; MANGANESE; MOBILITY; CHERNOZEM

459
Action of Arsenic Acid in the Soil

Margulis, H.; Bournigull, R.

Sol. Am. Agron. Serie 110, 550-566; 1949

SOILS; ARSENIC; ARSENIC ACID

460
Chemistry of Metal Chelate Compounds

Martell, A.E.; Calvin, M.

Prentice Hall Inc.; Englewood Cliffs, NY, 613 p.; 1952

CHELATES; METALS

461
Dehydration of Montmorillonite Containing Exchangeable Thallium and Lead Ions

Masar, J.; Fajnor, V.; Prirodoved. Fak., University of Komenskeho, Bratislav, Czechoslavakia

Silikaty (SIKTAN), 16(4), 289-294; 1972

SORPTION; WATER; MONTMORILLONITE; LEAD; THALLIUM; IONS; DEHYDATION; THALLIUM IONS; LEAD IONS

462
Copper, Nickel, and Zinc Released from Acid Coal Mine Spoil Materials of Eastern Kentucky

Massey, H.F.; Barnhisel, R.I.; University of Kentucky, Lexington, KY

Soil Science, 113 (3), 207-12; 1972

COPPER; NICKEL; ZINC; MINE SPOILS; ACID MINE DRAINAGE; PH; IRON; ALUMINUM; MANGANESE; PLANTS; PHYTOTOXICITY; AVAILABILITY; OATS; CHLOROSIS; ORANGE SEEDLINGS; WEATHERING; STREAMS; FISH; WATER

In successive extractions of soil solution from 7 coal mine spoil materials over a period of 35 weeks, the pH of the extract of a given material was found to follow one of three patterns: a continued decrease, a decrease followed by an increase, or a continued increase. It is assumed that a decreasing pH indicates that the primary products of sulfide oxidation are being produced more rapidly than they can be consumed and that an increasing pH indicates that sulfide oxidation has been completed or at least slowed. Concentrations of iron, aluminum, manganese, calcium, magnesium, and sodium found in the extracted solutions were grossly similar to those reported in spoil-bank leachates by other workers but as much as 112 parts per million nickel, 85 parts per million copper, and 145 parts per million zinc occurred in the soil solutions analyzed in this study. Concentrations of iron, aluminum, manganese, zinc, copper, and nickel were generally higher in extracts of low pH but the range of relative variation with pH did not appear to be as great for manganese, zinc, copper, and nickel as for iron and aluminum. In revegetation of spoil banks, toxicity from iron, aluminum, and manganese is a well-recognized problem. This paper suggests that possible toxicities from nickel, copper, and zinc must also be considered. The magnitude of the problem and the extent to which it is general cannot be assessed from this work. The major agronomic question is whether these metal ions contribute appreciably to failure to establish plants or poor growth of plants on spoil banks.

463
Adsorption Strength of Zinc for Soil Humus. 1. Relationship Between Adsorption Forms and Adsorption Strengths of Zinc Added to Soils and Soil Humus

Matsuda, K.; Ikuta, M.

Soil Sci. Pl. Nutr., 15, 169-174; 1969

EDTA; ZINC; ADSORPTION; SOILS; HUMUS; CHELATING; ION EXCHANGE

Zinc sorbed from ZnSO4 occurred mainly in the exchangeable form, except in a humic soil in which chelated form predominated. Zinc sorbed from Zn-EDTA occurred mainly in chelated forms.

464
Adsorption Strength of Zinc for Soil Humus Part 3. Relationship Between Stability Constants of Zinc Humic and Fulvic-Acid Complexes and the Degree of Humification

Matsuda, K.; Ito, S.; Shizuoka Univ., Iwata, Japan

Soil Sci Plant Nutr 16 (1). 1970 1-10.

ION EXCHANGE; EQUILIBRIUM METHOD; ADSORPTION; ZINC; SOILS; HUMIC ACID; FULVIC ACIDS; HUMIFICATION; CHELATES; AVAILABILITY; PLANTS; TOMATOES; STABILITY CONSTANTS

465
Environmental Toxicology of Pesticides. Proceedings of a United States-Japan Seminar

Matsumura, F.; Boush, G.M.; Misato, T.

Proceedings of a United States-Japan Seminar, Environmental Toxicology of Pesticides, 637p.; 1972

FOODS; WATER; AIR; SOILS; BHC; BIODEGRADABLE PESTICIDES; RESIDUES; CHLORINATED HYDROCARBONS; INSECTICIDES; FUNGICIDES; HERBICIDES; ORGANOPHOSPHATES; CARBAMATES; DEGRADATION; RESIDUES; INDUSTRY; URBAN; MERCURY

This book is concerned with environmental pollution caused by industrilization, urbanization and modern agricultural practices. The contributed papers discuss in detail the pesticide contamination of food, water, air and soil. It also examines the use of BHC in Japan and DDT in America, and proposes alternative methods of pest control, such as biodegradable pesticides, biological controls and nondetrimental chemicals. Several timely reviews of mercury pollution are included, with emphasis on the enviornmental hazards of organomercurial pesticides. The content is divided into 8 sections. The first section covers patterns of pesticide usage and occurrence of residues, followed by sections on mercury transformation in the environemnt and chlorinated hydrocarbon insecticides in the environment. Next, a section is included on fungicides, herbicides, organophosphates and carbamates, followed by a description of microbial influence on pesticide degradation. Part 6 discusses photodecomposition of pesticides, part 7 covers toxic effect of pesticide residues on wildlife, and the final section involves the design of new pseticides.

466
Formation and Decomposition of Methylmercury Compounds

Matsuno, T.; Yokohama Natl. Univ., Yokohama, Japan

Soda. To. Enso (STOEB8), 24(7), 227-236; 1973

METHYLMERCURY; DECOMPOSITION; MERCURY; METHYLMERCURY COMPOUNDS

467
Hazards to Livestock Caused by Inadequate Waste Dumping

Matthes, D.; Matthey, G.

Monatsh Vet. Med., 27, 875-6; 1972, November

LIVESTOCK; WASTES; DUMPING; ANIMALS

468
Lead Concentrations in Rocks, Soil, and Groundwater

Matthess, G.

Arbeitsgruppe Blei, 21-27; 1972

LEAD; ROCKS; GROUND WATER; .SOILS; AIR; COMBUSTION; AUTOMOBILE EMISSIONS; EXHAUST GASES; PESTICIDES; FERTILIZERS; SMOKE; METALLURGICAL PLANTS; COMBUSTION PROGRESS

The lead in rocks, soil, and groundwater stems from several sources which can be combined into two groups, natural lead concentrations and anthropogenic concentrations. After listing the natural lead concentration found in various rocks and soils of West Germany, The Netherlands, France, Great Britain, Spain, and the U.S.S.R., the anthropogenic lead concentrations are discussed. Studies in Scotland revealed a generally higher lead concentration in urban areas compared to rural areas. They are the consequence of air pollution by combustion processes, automobile exhaust gases, pesticides, and fertilizers. A local increase of the lead concentration in the soil near Langesheim/Lower Saxony to more than 100 mg/kg was caused by the smoke from a metallurgical plant. Higher than normal lead concentrations are found along busy streets and highways. Analysis of the lead concentration of the soil in various distance from the Autobahn Giessen/Frankfurt revealed a rapid decrease with increasing distance. This section of the Autobahn had been used by about 40 million automobiles. It is estimated that 1.2 kg lead have been emitted/m of the Autobahn. In the separating strip between the two directions, 147 mg extractable lead/kg soil was measured; at a depth of 20 to 40 cm 25 mg/kg; on the side 130 mg/kg; at 20 m distance, 26 mg/kg; at 50 m distance, 23 mg/kg; and at 100 m distance 19 mg/kg.

469
Oxidoreductive Degradation of Racemic Dopa by Soil Minerals and Clays

Mayaudon, J.; El Halfawi, M.; Batistic, L.

J. Soil Sci., 24(2), 1973, 182-192

5,6-DIHYDROXY INDOLE EU MELANIN BENTONITE; CHROMATOGRAPHY; DECARBOXYLATION; FERRIC OXIDE; ELECTRON ACCEPTORS; MINERALS; CLAY; DEGRADATION; RACEMIC DOPA

470
Bioelement Transport in Rainwater and Soil Solution in a Forest Ecosystem

Mayer, R.

Gottinger Bodenkundliche Berichte, 19, 1-119; 1971

TRANSPORT; RAINWATER; SOILS; FORESTS; TERRESTRIAL ECOSYSTEM

471
Building a Shorter Life (Cadmium Pollution).

McCaull, J.

Environment (ENVTAR), 13(7), 38-41; 1971

REVIEW; CADMIUM; FOODS; SOILS; VEGETATION; ABSORPTION

A review with 48 references and a discussion on the sources of cadmium pollution; Cd concentrations in food, soil, vegetation and commercial products; biological absorption of Cd; and physiological damage due to Cd.

472
Soil Mantle as a Wastewater Treatment System - A Literature Review

McGauhey, P.H.; Krone, R.B.; Winneberger, J.H.

Sanitary Engineering Research Laboratory, College of Engineering and School of Public Health, University of California, Berkeley, CA, SERL Report No. 66-7, p. 70-92; 1966

WASTEWATER TREATMENT SYSTEM; SOIL MANTLE; REVIEW; WASTEWATER; SOILS

473
Use of Tracer Technique in Soil Erosion Research

McHenry, J.R.; Sedimentation Laboratory, Oxford, Mississippi

Isotop. Radiat. Technol., 6, 280-287; 1969, Spring

EROSION; SOILS; TRACER TECHNIQUES; CHROMIUM 51; GOLD 198; IRON 59; SCANDIUM 46; MOVEMENT

Techniques used to study erosion by tagging soil with radioactive tracers are reviewed. Several nuclides have been used for this purpose, e.g., Fe 59, Sc 46, Au 198, and Cr 51. Guidelines to be followed in the selection of a tracer are reviewed, and methods of incorporating the isotope on the material to be traced are described. Studies are discussed in which both the movement of single grains of sand and the bulk movement of the soil are followed. (Auth)

474
Soil Copper. II. Specific Adsorption of Copper by Soils

McLaren, R.G.; Crawford, D.V.; Sch. Agric., Univ. Nottingham, Sutton Bonington/Loughborough/Leicestershire, England

J. Soil Sci. (JSSCAH), 24(4), 443-52; 1973

SOILS; ADSORPTION; COPPER; SOILS

475
Soil Copper. III. Isotopically Exchangeable Copper in Soils

McLaren, R.G.; Crawford, D.V.; Sch. Agric., Univ. Nottingham, Sutton Bonington/Loughborrough/Leicestershire, England

COPPER; ISOTOPIC EXCHANGE; SOILS

476
Transformation of Individual Coal-Tar-Chemical-Industry Organic Products in Chernozem Soil

Medvedev, V.A.; Davydov, V.D.; Donetsk. Oboshche-Bakhchevaya Opytn. Stants., Donetsk, USSR

Pochvovedenie (PVDEAZ) 11, 22-8; 1972

SOILS; PHENOLIC HYDROCARBONS; AROMATIC AMINES; COAL; TAR; INDUSTRIAL EFFLUENTS

477
Effect of Isomerism on the Rate of Phenol Transformation in Chernozem Soil

Medvedev, V.A.; Davydov, V.D.; Donetsk. Ovoshche-Bakhchevaya Opytn. Stants., Vses. Akad. S.-Kh. Nauk Im. Lenina, Donetsk, USSR

Pochvovedenie (PVDEAZ) 5, 122-7; 1973

PHENOL; CHERNOZEM; SOILS; HYDROXYL GROUP; DEGRADATION; ISOMERS

478
Rate of Degradation of Phenol and Quinones in a Chernozem Soil According to Redox Measurements and Infrared Spectroscopy Data

Medvedev, V.A.; Davydov, V.D.; Donetsk. Ovoshche-Bakchchevaya Opytn. Stants., Donetsk, USSR

Pochvovedenie (VODEAZ), 1, 133-7; 1974

SOILS; PHENOL; QUINONES; METABOLISM; NAPHTHOQUINONE; BENZOQUINONE; DEGRADATION; REDOX MEASUREMENTS; INFRARED SPECTROSCOPY

479
Zinc Content of Soils and their Different Fractions

Meelu, O.P.; Randhawa, N.S.; Dep. Soils, Punjab Agric. Univ., Ludhiana, India

J. Indian Soc. Soil Sci. (JINSA4) 1973, 21(2) 235-6; 1973

ZINC; SOILS; FRACTIONATION

480
Direct Vaporization and Quantification of Arsenic from Soils and Water

Melton, J.R.; Hoover, W.L.; Ayers, J.L.; Howard, P.A.

Soil Sci Soc Am Proc 37 (4). 1973 558-561.

ARSINE; DELIVERY APPARATUS; VAPORIZATION; ARSENIC; SOILS; WATER

481
The Determination of Mercury in Soils by Flameless Atomic Absorption

Melton, J.R.; Hoover, W.L.; Howard, P.A.

Soil Sci Soc Am Proc 35(5), 850-852; 1971

VAPOR AERATION SYSTEM; MERCURY; SOILS; ATOMIC ABSORPTION

482
Diffusion of Zinc in Soils as a Function of Applied Zinc, phosphorus, and Soil Ph

Melton, J.R.; Mahtab, S.K.; Swoboda, A.R.; Soil Corp. Sci. Dep., Texas A And M Univ., College Station, Tex.

Soil Sci. Soc. Amer., Proc. (SSSAA8) 1973, 37(3) 379-81; 1973

ZINC; SOILS; DIFFUSION; PHOSPHORUS; PH

483
Mechanism of Sorption of Hydroxycupric Ion by Clays

Menzel, R.G.; Jackson, M.L.

Soil Sci. Soc. Proc. 15, 122-124; 1950

SORPTION; CLAY; COPPER; HYDROXYCUPRIC IONS

484
Contamination of Soil and Fruit with Copper Containing Pesticides

Merenyuk, G.V.; Medzhibovskaya, Z.E.; Moldavian Res. Inst. Hyg., USSR

Gig Sanit 35 (1). 1970 108-110.

APPLES; MICROFLORA; VINEYARDS; SOILS; FRUITS; COPPER; PESTICIDES; CUPROSAN; BORDEAUX; COPPER SULFATE; ORCHARDS; RESIDUES

Application of cuprosan (0.6%) or bordeaux mixture (1%) sprays to an apple orchard increased soil Cu from 7-8 mg/kg to 18 and 14 mg/kg, respectively, in the 0-30 cm layer. Spraying with bordeaux mixture (1%) in vineyards over a period of 5 years resulted in up to 50 mg/kg Cu residues in the soil, the residues usually remaining in the 0.20 cm layer and penetrating deeper at a very slow rate. Cu residues in sandy loams, from cuprosan (0.6%) sprays, occurred to a depth of 1 m within 3 months after the first treatment; residues resulting from pesticides that contain 3 mg/kg Cu or more may, in these soils, depress microbial activity and organic-matter mineralization. Application of CuSO4 in the irrigation water decreased the microflora and nitrification in soil and tended to increase pH.

485
Renewing the Soil

Meyer, J.G.

Environment, 14(2), 22-24, 29-32; 1972, March

SOILS; REVIEW

486
Biology of Macrophomina-Phaseoli in Soil Studied with Selective Media

Meyer, W.A.; Sinclair, J.B.; Khare, M.N.

Phytopathology, 63(5), 1973, 613-620

SOYBEANS; CORN; POTASSIUM; PENICILIN; STREPTOMYCIN; SULFATES; CHLORONEB; MERCURY CHLORIDE; ROSES; BENGAL FUNGUS; FUNGI

487
Seepage Flows-Field Data Measurements for Evaluation of Potential Contribution of Fertilizers to Groundwater Pollution

Michna, L.; Bourodimos, E.L.

Soil Sci., 115(6), 401-408; 1973, June

ADSORPTION; GEOLOGY; MATHEMATICAL MODEL; ORGANIC MATTER; PERMEABILITY; SOILS; WATER; LANDFILLS; GROUND WATER; SEEPAGE; FLOW; DISPERSION; MODEL

A mathematical model using a convective dispersion equation is satisfactorily compared with field studies on soil permeability and water flow.

488
Abundance and Distribution of Lead, Zinc, Cadmium, and Arsenic in Soils

Miesch, A.T.; Huffman, C., Jr.

U.S. Environmental Protection Agency, Air Pollution Control Office, Publ. AP 91, 65-80; 1972

DISTRIBUTION; LEAD; ZINC; CADMIUM; ARSENIC; SOILS

489
Organo Mercurials as an Environmental Problem

Miettinen, J.K.

Part of Spencer, D.A. (Chairman). Nuclear Techniques for Studying Pesticide Residue Problems. Symposium. Unipub, Inc.: New York, NY, (p. 43-47), 84 p.; 1970

BACTERIA; SLUDGE; WATER; NUCLEAR TECHNIQUES; AGRICULTURE; PESTICIDES; RESIDUES; INDUSTRY; MERCURY

490
Hygienic Evaluation of the Mineral Composition of Soils in Regions of Bulgaria Marked by the Prevalence of Endemic Pleural Calcifications

Mikhailova-Docheva, L.

Gig Tr Prof Zabol, 16(5), 1972, 30-33

ASBESTOS INDUSTRIAL EMISSIONS; AIR; SOILS

491
Trace Nutrient Level in Coals and Carbon Dioxide-Humus Fertilizers and Their Effect on the Distribution of Manganese, Copper, and Molybdenum in Soil and Plants

Mikhailova, A.I.; Vlasov, N.A.; Irkutsk. Gos. University, Irkutsk, USSR

Mikroelem. Biosfere Primen. Ikh. Sel. Khoz. Med. Sib. Dal'NegoVostoka, Dokl. Sib. Knof. 3rd(27BUAA), 79-84,; 1971

COAL; HUMATE; MICRONUTRIENTS; PLANTS; SOILS; SODIUM; AMMONIUM; TRACE ELEMENTS; CARBON DIOXIDE; FERTILIZERS; DISTRIBUTION; MANGANESE; COPPER; MOLYBDEN UM

492
Arsenic Residues in Agricultural Soils of Southwestern Ontario

Miles, J.R.W.; Research Institute, Canada Department of Agriculture, London, Ontario, Canada

Journal of Agricultural Food Chemistry, 16, 620-622; 1968, July-August

ARSENIC RESIDUES; FARM SOILS; ORCHARDS; MEASUREMENT METHODS; ARSENIC; SOILS; TREES

Determination of arsenic residues in farm soils in southwestern Ontario showed the highest residue levels in orchard soils. Residues in four apple orchards were 10.2, 23.1, 39.8, and 197 ppm of arsenic between the trees, and 15.6, 44.9, 67.0, and 121 ppm under the trees. One vegetable soil contained 26.6 ppm of arsenic. The remainder of the 32 farm soils sampled contained residues of less than 10 ppm of arsenic, the normal range for untreated soils. Strata studies conducted on one orchard soil showed a fairly uniform vertical distribution of arsenic residues in the top 6 inches of soil. An improved standard-taper all-glass apparatus, for more efficient absorption of arsine gas in the arsine-molybdenum blue method for arsenic is described.

493
Pollution by Organic Substances

Milhaud, G.; Pinault, L.; Ecole Nat. Vet., Lab. de Pharmacie et Toxicol., Alfort, France

Gaz. Med. Fr., 79(40), 7637-7644; 1972

PESTICIDES; DDT; LINDANE; HEPTACHLOR; DEGRADATION; FISH; AQUATIC ORGANISMS; ENDOSULFAN; MERCURY; FOODS; SOILS; WATER; ORGANIC PESTICIDES; REVIEW; PERSISTENCE; PLANTS; HUMANS; ANIMALS; INDUSTRIAL EFFLUENTS; AIR; FISH; INSECTICIDES

General problems and hazards of soil and water pollution and of the contamination of foods by organic substances, including pesticides, are surveyed. Organochlorine pesticides, such as DDT, lindane, and heptachlor, are highly persistent in the soil. The time necessary for 95% degradation of heptachlor, lindane, and DDT in the soil was 3-5 yr, 3-10 yr, and 4-30 yr, depending on the soil type. Fish and other aquatic organisms are highly sensitive to pesticides in the water, which is demonstrated by instances of massive fish deaths due to DDT in Canada and to endosulfan in the Rhine, as well as by the very high DDT and mercury concentrations in clams, oysters, and fish, especially tuna. The acceptable daily intake of pesticide residues in foods should be determined with respect to the consumption of contaminated food for a very long period of time.

494
Water Soluble Chelating Agents in Organic Materials. II. Influence of Chelate Containing Materials on the Availability of Trace Elements to Plants

Miller, M.H.; Ohlrogge, A.J.

Soil Sci. Soc. Amer. Proc., 22, 228-231; 1958

TRACE ELEMENTS; PLANTS; AVAILABILITY; CHELATES; ORGANICS

495
Water-Soluble Chelating Agents in Organic Materials

Miller, M.H.; Ohlrogge, A.J.

Soil Sci. Soc. Am. Proc., 22, 225-228; 1958

SOLUBILITY; CHELATES; ORGANICS

496
Movement of Cadmium in Paddy Soils. 1. Cadmium Sulfide Dissolution and Soil Factors Affecting Movement

Minagawa, N.; Kamada, H.

Hokkaidoritsu Nogyo Shikenjo Shuho(HOSSAP), (27), 65-76; 1973

CADMIUM SULFIDE; SOLUBILITY; SOILS; IRON; CADMIUM; MOVEMENT; PADDY SOILS

497

Movemen of Heavy Metals in Mineral Soil. Growth of Corn Plants at High Levels of Copper, Lead, Cobalt, Nickel, and Cadmium in Soil

Minami, K.; Yasuda, T.; Araki, K.

Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku (TKNHAR), 25, 48-56; 1973

CORN; TRACE ELEMENTS; SOILS; MINERALS; TRANSLOCATION; MOVEMENT; LEAD; COPPER; COBALT; NICKEL; CADMIUM; PLANTS

498

Effect of Early Day Mining Operations on Present Day Water Quality

Mink, L.L.; College of Mines, University of Idaho, Moscow

Part of Proceedings, National Ground Water Quality Symposium, Held in Denver, Colorado, August 25-27, 1971 (p. 17-18); 1971

GROUND WATER; WATER QUALITY; MINE WASTES; ZINC; LEAD; CADMIUM; CONCENTRATION; SOILS; MINE TAILINGS; WATER; MINES

Data presented herein demonstrate that early day mining and milling wastes are now affecting the ground-water quality in several locations. Ground-water pollution results from leaching of old mine tailings that are intermixed with the upper part of the sand and gravel aquifer. High zinc, lead and cadmium concentrations occur in ground-water and soil samples taken from the portion of the sand and gravel aquifer containing old mine tailings.

499

Adsorption of Arsenites by Soils and Compost

Misra, S.G.; Benjamin, I.

Indian J. Appl. Chem., 25(2-3), 99-100; 1962

COMPOST; ADSORPTION; ARSENITE; ARSENIC; SOILS

Experiments were done to determine the amount of As retained when Na arsenite was added alone or with NaCl or K_2SO_4. A neutral soil absorbed more As than did an acid soil (pH 5.0) or a neutral compost.

500

Zinc Phosphate Interaction in Bhat Soils

Misra, S.G.; Pandey, R.S.

Technology (SINDRI), 9(2-3), 183-186; 1972

SULFATES; EDTA; FERTILIZERS; SOILS; ZINC PHOSPHATE

501

Studies on Arsenite-Arsenate System. Adsorption of Arsenate

Misra, S.G.; Tiwaki, R.C.; Agricultural Chemistry Station, University of Allahabad, Allahabad, (U.P.)

Soil Science and Plant Nutrition, 9, 10-13; 1963

ARSENITE; ARSENATE; SOILS; COMPOST; ANION EFFECT; CATION EFFECT; ARSENIC; ADSORPTION; IONS

In this investigation the retention of arsenate ions either singly or in the presence of arsenite by soils and compost has been studied. The interference caused by anions or cations on the retention of arsenate as well as the extraction of the absorbed arsenate by different extractants has also been investigated.

502

Retention of Applied Cu^{++} by Soils. Effect of Carbonate, Organic Matter, Base Saturation, and Unsaturation

Misra, S.G.; Tiwari, R.C.

Pl. Soil, 24, 54-62; 1966

ALKALINE SOILS; SOILS: RED SOILS; BLACK SOILS; PH; COPPER; HYDROGEN; CALCIUM; HYDROGEN IONS

The Cu-retaining power of the three soils investigated showed the decreasing order: alkali soil (pH 10.9), black soil (pH 7.8) and red soil (pH 6.7). The alkali soil retained the applied Cu in $CuCO_3$, $Cu(OH)_2$ forms due to its high $CaCO_3$ content (4.6%) and high pH, while the red soil retained the least Cu because of its low pH and negligible $CaCO_3$ content. When the soil samples were treated with H_2O_2 or H_2O_2+HCl or ignited at 500 degrees C, the retention of Cu decreased as a result of destruction of organic matter and CO_3 and dehydration of R_2O_3. Saturation of the soils with H (by HCl) resulted in lower Cu retention, while conversion of H-soils to Ca-soils resulted in a higher Cu retention which never approached the amount of Cu retained by the original soil (due to removal of CO_3 and antagonistic effect of H^+ ions); such samples contained more Cu in the exchangeable form, but addition of $CaCO_3$ resulted in the precipitation of almost all of the applied Cu and in the non-existence of exchangeable Cu.

503

Retention and Release of Copper and Zinc by Some Indian Soils

Misra, S.G.; Tiwari, R.C.

Soil Sci., 101, 465-471; 1966

COPPER; ZINC; BLACK SOILS; RED SOILS; ALKALINE SOILS; CARBONATES; PH; SOILS

Varying symmetrics of copper and zinc (amounts equivalent to the NH 4 exchange capacity of the soil expressed in meq) were added to a black soil, a red soil and an alkali soil and amounts of copper and zinc retained were determined. As increased symmetrics of copper and zinc were added, NH_4 exchange capacity of the soil tended to increase. Other factors like $CoCO_3$, soluble carbonates, and pH of the soils also affected copper and zinc retention. The amount of copper and zinc extracted by neutral normal NH_4 acetate was always less than the NH_4-exchange capacities of the soils. Even at the 4 symmetry level of addition, copper and zinc did not occupy all the exchangeable positions in the respective soils.

504
Studies on Arsenite-Arsenate Systems. Adsorption of Arsenate

Misra, S.G.; Tiwari, R.C.

Soil Sci. & Plant Nutr., 9, 216-219; 1962

ADSORPTION; ARSENATE; ARSENITE; SOILS; ARSENIC

505
Studies on the Chemistry of Copper and Zinc Applied to Three Different Soils - A Comparative Study

Misra, S.G.; Tiwari, R.C.

Soil Sci. Pl. Nutr., 12(3), 6-10; 1966

BLACK SOILS; ALKALINE SOILSS; SOILS; COPPER; ZINC; RED SOILS

Black soil retained more Cu and Zn than red and alkali soils did. Presence of soluble carbonates in alkali soil resulted in precipitation of the soluble Cu^{++} or Zn^{++} added. At 1-symmetry level (amount of Cu or Zn applied equivalent to the cation-exchange capacity of the soil) Cu retention by the soils was always greater than Zn retention. Removal of organic matter from red and black soils decreased Zn retention to a greater extent than Cu retention. Removal of carbonates from red and black soils decreased Cu retention more than Zn retention; removal of carbonates from alkali soil had the reverse effect. Amounts of the 0.1n HCl-soluble- and neutral n-NH_4-acetate-soluble fractions were greater for Cu than for Zn, hence the "fixed" form of Zn was always greater than that of Cu. When increased symmetrics of Cu and Zn were applied, cation-exchange capacities of the soils were only slightly affected and the contribution of the exchange process to Cu and Zn retention by the soils was only partial.

506
Arsenite-Arsenate Adsorption in Soils

Misra, S.G.; Tiwari, R.C.

Indian J. Appl. Chem., 26, 117-121; 1963

ARSENATE; IONS; RED SOILS; COMPOST; SESQUIOXIDES; PH; ARSENITE; ADSORPTION; CALCIUM; SOILS

More arsenate ions are adsorbed by a latoritic soil than by a red soil or compost, due to the amount of Fe2O(3) or sesquioxides, Ca or some other ion and reducing pH in the soil. Arsenite adsorption is affected by the presence of AsO4(3-) ions; it decreases in soil but increases in compost. Arsenite ions are converted into arsenate ions by Fe2O(3) or alkalinity.

507
Effect of Fertilizers and pH on Retention of Copper by Soils

Misra, S.G.; Tiwari, R.C.

J. Indian Soc. Soil Sci., 12, 289-295; 1964

BLACK SOILS; RED SOILS; SANDY LOAM; PH; FERTILIZERS; SOILS; COPPER; NITROGEN; POTASSIUM

Retention of Cu applied as $CuSO_4$ to a black soil, a red soil, and a sandy loam was studied. The black soil retained most copper owing to its high contents of organic matter and CO(3) and to its high pH. In presence of N and K fertilizers, Cu retention by soils decreased appreciably; this decrease was presumably due to antagonistic effects of NH_4^+ and K^+ and to the lowering of the equilibrium pH. The amount of "fixed" Cu (not extracted by 0.1 in H_2SO_4) increased and exchangeable Cu (extracted by n BaCl) decreased as the dose of N and K fertilizers increased.

508
Studies on the Adsorption and Release of Copper by Soils. 1. Effect of Cations.

Misra, S.G.; Tiwari, R.C.

Soil Sci. & Plant Nutr., 8, 93-96; 1962

COPPER; SOILS; CATIONS; ADSORPTION; RELEASE

509
Trace Elements in Soils

Mitchell, R.L.

Part of Technical Bulletin 21, Ministry of Agriculture, Fisheries and Food, Proceedigs of Soil Scientists of the National Agricultural Advisory Service Conference, February 8-9, 1966, (p. 8-20), 217 p.; 1971

TRACE ELEMENTS; TITANIUM; MANGANESE; BARIUM; ZIRCONIUM; STRONTIUM; CHROMIUM; VANADIUM; ZINC; NICKEL; LEAD; GALLIUM; COPPER; BORON; COBALT; TIN; BERYLLIUM; MOLYBDENUM; SELENIUM; MOBILITY; DRAINAGE; ORGANIC MATTER; ADSORPTION; IONS; COMPLEXES; PH; LIMING; PLANTS; UPTAKE

The total content of any trace element in a soil can give no more than a general indication of the probable status from the point of view of plant uptake. The available or soluble part may be only a few percent of the total. Sampling and analytical errors and variations over fields and with depth make it difficult to get reliable values; poor drainage and/or soil types, pH (effect of liming) can have significant effects on trace element availability. Thus, the uptake of many important trace elements (cobalt, manganese, zinc, boron and nickel) is reduced by liming, but that of molybdenum is increased (sometimes to dangerous levels in copper-poor soils). Many factors affect the effectiveness and duration of response when trace elements are added. The nature of the soil can determine the best method of dealing with trace element deficiencies. Some method of measuring the availability of trace elements is required. The amount extracted by water, chelating agents, ammonium acetate or acetic acid aave been used in various cases. The interpretation also depends on soil type, plant species, moisture conditions, temperature, etc., of the growing season. With these reservations, some information on the average contents of trace elements is given and deficiency levels for certain types of soils given for cobalt, copper, manganese, boron and excessive levels for nickel, zinc and molybdenum.

510
Trace Elements in Soils

Mitchell, R.L.

Part of Bear, F.E. (Ed.), Chemistry of the Soil (2nd Ed.), Amer. Chem. Soc. Monograph; 1964

TRACE ELEMENTS; SOILS

511
Behavior of Cadmium in Soil, and Change of Cadmium Content in Rice in Relation to the Oxidation Reduction Potential of Soil

Mizuno, N.

Nippon Dojo-Hiryogaku Zasshi, 43(5), 179-181; 1972

CADMIUM; RICE; OXIDATION REDUCTION; SOILS; MOBILITY

512
Transformation of Four Different Iron-Chelate Compounds in Four Different Soils.

Moawad, A.M.; Univ. Giessen, German Federal Republic

Geoderma, 4, 101-107; 1970

STABILITY; MONOOXETHYLAMINO-DIACETIC ACID; DIETHANOLAMINO-ACETIC ACID; CHELATES; PH; EDTA; NTA; NITRILOTRIACETIC ACID; TRANSFORMATION; SOILS; IRON CHELATES; IRON EDTA

Extraction procedures using water, 0.5 N HHCl or lactate solution showed that the Na salt of Fe-EDTA possessed greater stability (especially in acid soil) than the Fe salts of nitrilotriacetic acid and especially of monooxethylamino-diacetic acid and diethanolamino-acetic acid. Stability of the Fe chelates decreased with increasing soil pH, so that little of the Fe chelates remained water-soluble in calcareous fen soil (pH 8.4, $CaCO_3$ 8.4%).

513
Behavior of Cerium 144 in Various Types of Soil

Molchanova, I.V.

Tr. Inst. Ekol Rast. Zhivotn., 61, 4-11; 1968

CERIUM 144; ADSORPTION; SOILS; IRON; ALUMINUM; COPPER

Microquantities of Ce 144 in solution at acid pH values were completely absorbed by the types of soils that were studied. In the range of neutral and alkaline pH values, the absorption of cerium by soils was decreased. The type of soil also had an effect on the stability of cerium binding in the soil. The cerium was bound most securely in turf-meadow soil and black soil (cernozyom). Absorbed cerium was more easily removed from all soils by the salts of iron than by salts of aluminum and copper. The presence of colloids of iron in the solution decreased the absorption of cerium by soils in the range of pH values studied. The percent sorption of Ce 144 by soils decreased more sharply as a result of the presence of iron colloids than the concentration of iron in the solution. Aqueous extracts from the leaves of ligneous plants increased the mobility of cerium in the soil-solution system for all of the types of soils studied.

514
Mercury in Soil and Plant Systems: A Review of Literature.

Moraghan, J.T.; N. Dak. St. Univ., Fargo, N.D.

Farm Res., 28(4), 53-55; 1971

MERCURY; SOILS; PLANTS; REVIEW

515
Soil Contamination.

Morishita, T.; Tokyo Educ. Univ., Tokyo, Japan

Kagaku Kogyo (Chem. Ind.) 23(10), 1322-1327; 1972

ARSENATE; COPPER SULFATE; ORCHARDS; TOPSOIL; ARSENIC; COPPER; METALS; APPLES; ABSORPTION; ROOTS; ORANGES; FRUITS; PLANTS; PESTICIDES

Large quantities of arsenate and copper sulfate pesticides are used in apple and orange orchards outside Yokohama. The topsoil of orchards has a considerable accumulation of arsenic and copper. For instance, 500 ppm of arsenic and more than 200 ppm of copper have been detected in the topsoil of a 50-year-old apple orchard in Aomori. These metals cause increased metal ion concentration in soil which in turn will increase the metal absorption by the roots of produce.

516
Distribution of Arsenic from Poultry Litter in Broiler Chickens, Soil and Crops

Morrison, J.L.

J. Agr. Food Chem., 17(6), 1288-90; 1969

ORGANOARSENIC; POULTRY; ARSENIC; CHICKENS; CROPS; LITTER; FERTILIZERS; BIRDS; SOILS

The effect of the presence of organoarsenicals from feed additives in poultry house litter was investigated with respect to the distribution of arsenic in chickens raised on this litter, to the distribution of arsenic in soil fertilized with this litter and to the distribution of arsenic in crops raised on soil fertilized with this type litter. Although measurable amounts of arsenic (15 to 30 ppm) were found in litter, the arsenic content of soil and soil crops was unaffected by the use of poultry litter as fertilizer. Similarly, the arsenic content of birds was unaffected when raised on this type litter. (27 references)

517
Complexing of Metals by Soil Organic Matter

Mortensen, J.L.

Soil Sci. Soc. Amer. Proc., 27, 179-186; 1963

ION EXCHANGE; ADSORPTION; CHELATION; COMPLEXES COAGULATION; PEPTIZATION REACTIONS; POLYMERLIGANDS; SOILS; HYDROXY GROUPS; CARBOXYL GROUPS; AMIDE GROUPS

Soil organic matter forms complexes with metals by ion exchange, surface adsorption, chelation and complex coagulation and peptization reactions. Little is known about the nature of ligands in polymeric components of soil organic matter that chelate metals, but carboxyl, hydroxy and amide groups are probably concerned. A number of compounds of low molecular weight, capable of chelating metals have been isolated from soils.

518
Sorption of Anions by Soils

Mott, C.J.B.; Univ. Reading, England

Part of Sorption and Transport Processes in Soils, Monogr. Soc. Chem. Ind., No. 37, (40-53); 1970

ORGANIC MATTER; REVIEW; SORPTION; TRANSPORT; ANIONS

Some experimental results for specifically adsorbed mono- and di-valent ions are reviewed and related to soil conditions ignoring the role of organic matter.

519
Geochemical Reconnaissance of Surficial Materials in the Vicinity of Shawangunk Mountain, New York

Moxham, R.L.

N.Y. State Mus. Sci. Serv. Map Chart Ser., 21, 1-20; 1972

HUMANS; WATER SUPPLY; STREAMS; WATER; SEDIMENTS; SOILS; LEAD; COPPER; ZINC

520
Agricultural Chemicals as Pollutants

Mrak, E.M.

Part of White, Philip L. and Nancy Selvey (Ed.). Western Hemisphere Nutrition Congress 3. Symposium. Miami Beach Florida, Aug. 30-Sept. 2, 1971. Futura Publishing Co., Inc: Mount Kisco, NY, (p. 284-288), 389 p.; 1972

HUMANS; PESTICIDES; AIR; WATER; SOILS; PLANTS; FOODS; AGRICULTURE

521
The Biological Cycle of Iron and Managanese in Soil and Aquatic Media.

Mulder, E.G.; Microbiological Laboratory, Wageningen, Netherlands

Revue d'Ecologie et de Biologie du Sol., 9(3), 321-348; 1972

IRON; MANGANESE; SOILS; AQUATIC ECOSYSTEMS; MICROORGANISMS; REVIEW; OXIDATION; REDUCTION; PRECIPITATION; TRANSFORMATION

The role of micro-organisms in the transformations (oxidation, reduction, precipitation) of Fe and Mn in soil and aquatic environments is discussed, with 46 references.

522
Response of Alfalfa-D to Boron in Fly Ash

Mulford, F.R.; Martens, D.C.

Soil Sci Soc Amer Proc 35 (2). 1971 296-300.

ZINC; SOILS; PH; FLY ASH; BORON

523

Cadmium Compartmentation and Cycling in a Grassland Ecosystem in the Deer Lodge Valley, Montana

Munshower, F.F.

Ph.D. Thesis Botany Department, University of Montana, Missoula Montana, 106 p.; 1972

CADMIUM; HEAVY METALS; SOILS; GRASSHOPPERS; GRASSES; PLANTS; BROAD LEAFED PLANTS; LEAVES; FOLIAR ABSORPTION; UPTAKE; FORBS; SHRUBS; TRANSLOCATION; AIR; DUSTS; ANIMALS; CATTLE; PIGS; SQUIRRELS; KIDNEYS; DDT; FOOD CHAINS; CONCENTRATION FACTOR; ACCUMULATION; CONCENTRATION; GRAINS; LIVER; HUMANS; MEATS; VEGETABLES; PH; SULFUR DIOXIDE; PARTICULATES; MOBILITY; COMPUTER SIMULATION; ATOMIC ABSORPTION SPECTROPHOTOMETRY; CYCLING; ZINC; AVAILABILITY; TRANSLOCATION; CHLOROSIS; ENZYMES; CORN; SMELTERS; ELECTROSTATIC PRECIPITATORS; ALFALFA; BARLEY; TREES; WILLOW; WHEAT; FOX; BADGER; WEASEL; COMPLEXES

The distribution of cadmium in surface horizons and its relationship to soil pH suggests that cadmium, like other heavy metals, will form insoluble complexes in neutral or alkaline soils. High carbonate soils are common in much of the Deer Lodge Valley and this may explain the retention of cadmium in the surface horizon without apparent harm to plant community development in lightly polluted areas. Within the five ppm isopol low soil pH values and high heavy metal concentrations combined to restrict community development. The ultimate cause of restricted community development has not been explained, but germination studies in soils two miles from the smelter revealed reduced seed germination rates and very restricted root development in plants surviving the seedling stage. The animal community reflected the depauparate plant communities within this isopol. Few immature or adult grasshoppers were available for analyses whereas all stages of development of these insects were abundant at sites more distant from the smelter. Small mammals and Columbian ground squirrels were also notably absent from these areas. Plants in the Deer Lodge Valley exhibited cadmium concentrations above those of the same plants growing on unpolluted sites. Cadmium did not appear in grasses at levels exceeding those found in the soil of the site, but broad leafed annuals consistently demonstrated cadmium concentrations above the cadmium levels of the soil in which the plant was growing. Whether this was a phenomenon associated with the shape of the leaves and foliar absorption or was due to active root uptake remains unanswered. Shrubs collected near the smelter had cadmium concentrations greater than those of the soils in which they were growing. The plumose leaved shrubs (Tetradymia and Chrysothamnus) were probably reflecting the degree of foliar contamination and subsequent absorption and translocation of cadmium from airborne dust rather than cadmium absorption by their roots. Most samples of Salix and Populus exhibited cadmium levels well in excess of those found in soils near the collecting site. However, these specimens were collected near a potential source of aerial contamination and soil cadmium accumulation is questionable. Unlike plants, the herbivore trophic level showed cadmium accumulation in all of the animals investigated. The grasshopper samples exhibited extremely high cadmium accumulations and contamination by airborne dust particles was indicated by their geographical location. Near the smelter this probably reflected respiratory intake of cadmium in airborne dust particles. The absence of adult grasshoppers during late summer near the smelter may be indicative of an accumulation to toxic levels of this element or of other heavy metals. Cadmium concentrations in the kidneys of vertebrates increased with the age of the animal. Maximum concentrations in cattle, swine and ground squirrel kidneys were evidence of the accumulation of cadmium in this organ to levels two or more times the cadmium levels found in the food supply of the animal. Food chain transfer of toxic materials such as DDT is usually characterized by a ten to one concentration of the substance as it passes from one trophic level to the next. The present study has shown that cadmium accumulation occurred in several plants, in grasshoppers, and in the kidneys of vertebrates, but not at the ratio assumed to occur in typical food chain transfer of toxic materials. Cadmium concentration ratios were typically less than three to one rather than the classical ten to one ratio. No sample of grain exceeded the cadmium tolerance limits applied to rice in Japan (1 ppm) but all kidney samples from cattle and swine and several of the liver samples demonstrated cadmium levels equal to or in excess of this tolerance limit. Long lived species such as man can be expected to accumulate even larger quantities of cadmium due to the slow turnover of this metal once bound in the soft tissues of the body. Meat, vegetables and grains produced in the study area should be monitored for heavy metal content to prevent high cadmium accumulations in man. The removal of cadmium from soils of the Deer Lodge Valley is extremely slow. The results of the simulation program indicated that, even if current practices that aggravate the cadmium problem were alleviated, many centuries would be required before soil cadmium levels in grasslands would be reduced to the soil cadmium range suggested by Vinogradov (1959). If the present patterns of smelter operation continue, sulfur from stack emissions will accumulate in soils causing a decrease in soil pH. Furthermore, fine particulates from the main stack at the smelter and the numerous smaller stacks will augment the heavy metal content of valley soils. Increasing soil acidity and heavy metal concentrations will create larger areas in which soil heavy metal content is toxic to most plants. This problem is further co

524

Ecological Compartmentation of Airborne Cadmium in a Grassland Ecosystem

Munshower, F.F.; Behan, M.J.

Am. J. Bot., 58, 476; 1971

AIR; CADMIUM; GRASSLAND ECOSYSTEMS; TERRESTRIAL ECOSYSTEM; GRASSHOPPERS; SOILS

525

Arsenic Residues in Potato Soils and Tubers

Murphy, H.J.; Goven, M.J.

Maine Farm Res., 13(3), 4-8; 1966

ARSENIC; RESIDUES; POTATOES; SOILS; TUBERS

526

Biological Treatment of Cyanide Waste

Murphy, R.S.; Nesbitt, J.B.

Research Bulletin, B-88, Penn. State University, Dept. of Engineering, University Park, PA, 66 p.; 1964

CYANIDE; WASTES; CYANIDE WASTE; BIOLOGICAL TREATMENT

527

Plant Nutrient Availability in Soils. IV. Studies on the Role of Copper in Danish Soils. 3. The Exchange Properties with Particular Reference to Fixation and Release Processes

Nafady, M.H.; Lamm, C.G.; Technical University of Denmark, Chemistry Department, Lyngby, Denmark

Part of Symposium on the Use of Isotopes and Radiation in Research on Soil-Plant Relationships, including applications in forestry, International Atomic Energy Agency, Food and Agriculture Organization of the United Nations, Vienna, December 13-17, 1971; 1971

COPPER; CALCIUM; SOILS; ADSORPTION; FIXATION; AVAILABILITY; RELEASE

The examined soils obey the Ratio Law for the ion pair Cu-(Ca(I)Mg). The copper equilibrium activity ratio has the same value regardless of Ca concentrations up to 9.05 moles per liter and soil solution ratios (1:10 - 1:40). Thus the value of the copper equilibrium activity ratio of a given soil can be taken as a measure of its availability or intensity. The copper Q/I relations exhibit two parts: (a) a curved lower part and (b) a linear upper part. The slope of the upper part can be used as a tool for the capacity factor, i.e. Copper Potential Buffering Capacity (PBC(Cu)). The value of the lower part can be used as a crude measure of the number of sites holding Cu tightly, e.g., exchange sites and complexing sites. Most of copper added to the soil was fixed by air-drying. Extraction by 0.1 M HCl for several times did not recover more than 72 percent of the added Cu. The steady rate of release of the fixed copper is very low, indeed, compared to soil potassium.

528

A Statistical Evaluation of the Inter-Relationships Between Particle Size Fractions, Free Iron Oxide and Trace Elements.

Nair, K.P.P.; Cottenie, A.; State University of Ghent, Belgium

J. Soil Sci., 22, 203-209; 1971

ALUMINUM; ZINC; COPPER; MANGANESE; LEAD; IRON; STATISTICAL ANALYSIS; TRACE ELEMENTS; METALS; IRON OXIDES

Regression analysis indicated that total Fe was associated mainly with the 0-2 micrometer fraction, total Al and Cu were associated mainly with the 2-10 micrometer fraction and total Zn, Mn and Pb with the 10-20 micrometer fraction. Corresponding associations between extractable contents and particle size fractions were: Al, 0-2 micrometer; Zn, 2-10 micrometer; Cu, Mn, Pb and Fe, 10-20 micrometer.

529

Chrome-Lignin-Type Soil Stabilizers

Nakajima, K.; Sanyo Kokusaku Pulp Co., Tokyo, Japan

Kobunshi Kako (KOKABN), 21(11), 703-709, 802; 1971

REVIEW; CHROMIUM; LIGNIN; SOILS ; STABILIZATION

530

Fixation of Heavy Metal Ions in Soil by 2,4,6-Trimercapto-S-Triazine Salts

Nakamura, Y.; Umehara, A.; Yamada, I.

Ger. Offen.(GWXXBX) 2240733 (a 01N), 20 Aug 1971, 17 p. (patent).; 1973

MERCAPTOTRIAZINE; FIXATION; METALS; SOILS; TRIAZINE; MERCURY; CADMIUM; LEAD; COPPER

531

Metabolism of Beta Methyl Malic-Acid by a Soil Bacterium

Nakano, H.; Sasaki, K.; Kurokawa, Y.; Katsuki, H.

J Biochem (Tokyo) 70 (3). 1971 429-440.

ALPHA KETO BUTYRIC-ACID; ENZYMES; CHROMATOGRAPHY; GEL; ELECTROPHORESIS; SOILS; METABOLISM; BETA METHYL MALIC-ACID; MALIC ACID; BUTYRIC ACID

532

Aqueous Migration of Chemical Elements in Regional Plain-Type Landscapes

Nalivkin, Y.V.; Kazan. Gos. Univ., Kazan, USSR

Sb. Aspir. Rab., Kazan, Gos. Univ., Khim., Geogr., Geol. (25QSAV), 83-7.; 1970

TRACE ELEMENTS; MIGRATION; WATER; SOILS; LEACHING; ROCKS; REGIONAL PLAINS; LANDSCAPE; PLAINS; TRANSPORT

533

Improvement of Soil Polluted with Heavy Metals

Nanbu, W.; Nanbu, T.; Kiresuto Giken Co., Ltd.

Japan. Kokai, (JKXXAF), 73 59087 (13(9)B5), 3 p. (patent); 1971

METALS; SOILS; CHELATES; HEAVY METALS

534
Effects of some Environmental Factors on the Reaction of the Soil Microflora to Pesticides

Naumann, K.; Inst. Phytopathol. Aschersleben, Dtsch. Akad. Landwirtschaftswiss., Berlin, East Germany

Zentralbl. Bakteriol., Parasitenk., Infektionskr. Hyg., Abt. 2(ZBPIA9) 1972, 127(4) 379-96; 1972

PESTICIDES; SOILS; ACTINOMYCETE; VAPAM; DAZOMET; ALLYL ALUMINUM CARBIDE; FORMALIN; WATER; WATER-BINDING; DECOMPOSITION; DEHYDROGENATION; INHIBITION; GREENHOUSE; BINDING

Vapam (0.15%), dazomet (420 ppm), allyl AlC (200 ppm), and formalin (0.2%), added to soil in greenhouse boxes, inhibited growth of bacteria and actinomycetes for a longer period at 12-15 degrees than at 20 degrees. Inhibition of bacteria by these preperations was greater at low or high soil moisture (40 or 80% water-binding capacity) than at intermediate soil moisture (60%), whereas actinomycetes were inhibited most strongly at intermediate and high soil moisture. Dehydrogenase activity was generally increased and cellulose decomposition decreased more in moist than in dry soil. Covering the treated soil with gas-impermeable plastic film prolonged the inhibitory action of the pesticides.

535
Effect of Soil Clay Type on the Availability of Zinc in Some Mediterranean Rendzina Soils

Navrot, J.; Gal, M.

J. Soil Sci., 22(1), 1-4; 1971

ZEA-MAYS-M; PLANTS; ATTAPULGITE; MONTMORILLONITE; PREDOMINANT MINERAL; ZINC; AVAILABILITY; SOILS; RENDZINA SOILS; CLAY; CORN

536
Biodegradation of Phenylmercuric Acetate by Mercury-Resistant Bacteria

Nelson, J.D.; Blair, W.; Brinckman, F.E.; Colwell, R.R.; Iverson, W.P.; Dep. Microbiol., Univ. Maryland, College Park, Md.

Appl. Microbiol.(APMBAY) 1973, 26(3) 321-6; 1973

PHENYLMERCURY; BACTERIA; MERCURY; DEGRADATION; PHENYLMERCURIC ACETATE

537
The Chemistry of Zinc Added to Soils and Clays

Nelson, J.L.; Melsted, S.W.

Soil Sci. Soc. Amer. Proc., 19, 439-443; 1955

ZINC; CHEMISTRY; SOILS; CLAY

538
Soil Organic Matter and Trace Metal Interactions

Nelson, W.E.

Part of Hemphill, D.D. (Ed.), Trace Substances in Environmental Health-IV University of Missouri, Columbia, MO, June 23-25, 1971, (p. 132-143), 456 p.; 1971, June

ORGANIC MATTER; SOILS; TRACE ELEMENTS; TRANSPORT

539
Fate of Trace-Metals (Impurities) in Subsoils as Related to the Quality of Ground Water.; Final Rept.

Nelson, W.E.; Tuskegee Inst., Ala. Carver Research Foundation.

Proj. OWRR-B-028-ALA; Contract DI-14-01-0001-3053; Monitoring Agency Report No. W73-07802, OWRR-B-028-ALA(3); PB 219402/7; 181p.; 1972, September

WATER; GROUND WATER; TRACE ELEMENTS; SOIL CHEMISTRY; AGRICULTURAL WASTES; PRECIPITATION; ADSORPTION; RUNOFF; METALS; CHELATION; LIGANDS; FERTILIZERS; CONCENTRATION; ION EXCHANGE; PESTICIDES; TRANSPORT; SOILS; SUBSOILS

The report presents findings of a two-year study of the ground water pollution hazard from trace-metals which are applied in agricultural chemicals. The study establishes whether movement through the soil constitutes a significant source of trace-metals found in surface and ground water, identifies the properties of soils that control the extent of (quantity of) metals moving in and through the soil, establishes the relation of this movement to the concentration of the various metals in the water originating on agricultural lands, and examines the possible use of cationic polymers or other organic compounds in controlling the extent of trace-metals in water.

540
The Effect of Flooding and Aeration on the Mobility of Certain Trace Elements in Soils

Ng, S.K.; Bloomfield, C.

Plant & Soil, 16, 108-135; 1962

FLOODING; AERATION; TRACE ELEMENTS; SOILS; IRON; COBALT; NICKEL; ZINC; LEAD; VANADIUM; MOLYBDENUM; CHROMIUM

Iron, cobalt, nickel, zinc, lead, vanadium, molybdenum, and chromium were mobilized when soils were flooded and incubated anaerobically with plant material.

541

Rates and Routes of Transport of PCB's in the Environment

Nisbet, I.C.T.; Sarofim, A.F.

Environ. Health Perspect, 1, 21-38; 1972

PERSISTENCE; POLYCHLORINATED BIPHENYLS; AROCHLOR; LANDFILLS; RIVERS; LAKES; SEDIMENTS; VOLATILIZATION; AERIAL TRANSPORT; FALLOUT; LEACHING; DUMPS; SEA; OCEAN; FRACTIONATION; PHOTOLYTIC DECOMPOSITION; METABOLISM; EXCRETION; DDT; RESIDUES; HALF-LIFE; PCB; SOILS

Because of their wide dispersal and persistence in the environment and tendency to accumulate in food chains with possible adverse effects, polychlorinated biphenyls (PCB's) give rise to general concern. The sole manufacturer of PCB's in North America is the Monsanto Company (trade name Arochlor). Current uses of PCB's are enumerated. The company has restricted sales of Arochlors based on possible contamination of food products. Routes into the environment (in North America) may occur through landfill dumps, through rivers and Great Lakes' sediments, or through attachment to sediments on the continental shelf. Transfer of PCB's may occur through: volatilization, aerial transport on particulates, and fallout; leaching from dumps; sediment transport in rivers and sea sediments; and sedimentation in the ocean. Processes by which the compounds of PCB mixtures may change after release into the environment are: fractionation (according to solubility and vapor pressure of isomers); photolytic decomposition; and metabolism and excretion. In analogy with DDT residues, PCB's in soil have a half-life of about 5 years. (83 references)

542

Effect of Chelating Agents on the Movement of Fission Products in Soil

Nishita, H.; Essington, E.H.; University of California, Los Angeles, California

Soil Science, 103, 168-176; 1967

CHELATION; ZINC 65; STRONTIUM 85; STRONTIUM 90; YTTRIUM 91; RUTHENIUM 106; CESIUM 137; CERIUM 144; PROMETHIUM 147; MOVEMENT; SOILS; FISSION PRODUCTS

Chelating agents, ethylenedinitrilotetraacetic acid (EDTA), carboxynethyliminobisethylenitrilotetraacetic acid (DTPA), and ethylenediiminchbisohydroxyphenylacetic acid (EDDHA), and deionized water were evaluated as to their ability to move several radioactive fission products (Sr 89, Y 91, Ru 106, Cs 137, and Ce 144) in different kinds of soils. Different soils exhibited considerable difference in the effectiveness of the various leaching agents. Irrespective of the kind of soil, the order of magnitude of movement by water leaching generally was Cs 137, Y 91, Cd 144, Sr 89, Ru 106. Except in one soil (Hanford sandy loam), practically no movement of Cs 137, Y 91, or Ce 144 occurred by H20 leaching. Among the chelating agents, the effectiveness of EDDHA was generally the least, while the relative effectiveness of DTPA and EDTA varied with the soil and radionuclide. The possible causes for the variations in the effectiveness of different leaching agents in different soils were discussed.

543

Stability of PCB in Soil (Polychlorinated Biphenyls)

Nissen, T.V.; Statens Planteavls-Lab., Denmark

Tidsskr. Planteavl, 77(4), 533-9; 1973

AROCHLOR; SOILS; MICROFLORA; POLYCHLORINATED BIPHENYLS; PCB; DEGRADATION

Arochlor (polychlorinated biphenyls) was not degraded after 9 weeks in moist soil at 25 degrees. Carbon dioxide production in the soil was not affected by 1% Aroclor 1254. Soil microflora were apparently unable to degrade polychlorinated biphenlys under favorable conditions.

544

Equilibria of Metal Chelates in Soil Solution.

Norvell, W.A.

Part of Micronutrients in Agriculture. Soil Sci. Soc. Amer., Inc., 677 South Segoe Road, Madison, Wisconsin 53711, p. 115-136; 1972

EQUILIBRIUM; CHELATES; SOILS; TRACE ELEMENTS; MICRONUTRIENTS

545

Reactions of Diethylenetriamine Pentaacetic-Acid Chelates of Iron Zinc, Copper and Manganese with Soils

Norvell, W.A.; Lindsay, W.L.

Soil Sci. Soc. Am. Proc., 36(5), 778-783; 1972

PH; ATOMIC ABSORPTION SPECTROPHOTOMETRY; MICRONUTRIENTS; FERTILIZERS; IRON; ZINC; COPPER; MANGANESE; SOILS; CHELATES

The Fe, Zn, Cu and Mn chelates and the Na salt of DTPA were reacted with suspensions of acid and alkaline soils (suspension pH 5.8-7.9) for up to 30 days. FeDTPA was effective in maintaining soluble Fe and pH 5.8-7.3 and even at pH 7.9 more than 30% of the added Fe remained soluble after 30 days in a calcareous soil. DTPA was not effective as a chelate for Zn and Cu in soils at pH 5.8 and 6.2 but became more effective with increasing pH. MnDTPA was unstable in all soils and essentially all the Mn was lost from solution in 3 days. In most soils, the Na salt of DTPA reacted immediately to form chelates with whatever divalent and trivalent cations were soluble or readily exchangeable.

546

Retention of EDTA Complexes of Fe, Zn, Mn, and Cu With Soils

Norvell, W.A.; Lindsay, W.L.

Soil Sci. Soc. Amer. Proc., 33, 86-91; 1969

RETENTION; EDTA; IRON; ZINC; MANGANESE; COPPER; SOILS; CHELATES

547
Decachlorination of Polychlorinated Biphenyls and its Application to Soil and Rice Analyses

Nose, K.; Natl. Inst. Agric. Sci., Tokyo, Japan

Nippon Nogei Kagaku Kaishi(NNKKAA) 1972, 46(12) 679-81; 1972

SOILS; RICE; PCB; POLYCHLORINATED BIPHENYLS; DECHLORINATION

548
Diffusion of Iron and Iron Chelates in Soil

O'Connor, G.A.; Lindsay, W.L.; Olsen, S.R.; Colo. St. Univ., Fort Collins

Proc. Soil Sci. Soc. Am., 35, 407-410; 1971

UPTAKE; SELF-DIFFUSION COEFFICIENTS; IRON; IRON CHELATES; SOILS; DIFFUSION; IRON EDTA; IRON DTPA; IRON EDDHA; LOAM; SAND

Self-diffusion coefficients of Fe, FeEDTA, FeDTPA and FeEDDHA in aqueous solutions and of Fe and FeEDDHA in sandy loam and loam soil were determined using 59Fe. The uptake of 59Fe by sorghum seedlings from loamy sand containing 10 mCi 59Fe/mg soil, 59Fe + 0.16, 0.4 or 0.8 ppm Ca as CaEDDHA and 0.16, 0.4 or 0.8 ppm Fe as FeEDDHA increased linearly with Fe concentration in solution. Diffusion coefficients were 6.2 x 1E-6, 5.4 x 1E-6, 4.2 x 1E-6, and 3.9 x 1E-6 cm2sec-1 for Fe, FeEDDHA, FeDTPA and FeEDTA, respectively. Corrected diffusion coefficients in soil were 1.5 x 1E-7 and 1.85 x 1E-7 cm2sec-1 for Fe and FeEDDHA, respectively.

549
Balance of Producers and Decomposers in a Grassland Ecosystem in Obihiro. 7. Movement of Sodium, Iron, Manganese, Zinc, Copper, Cobalt, and Nickel

O'Hara, H.; Yoshida, N.; Chang, W.K.

Nippon Sochi Gakkai-Shi (NPSGAI), 18(2), 75-84; 1972

TRACE ELEMENTS; GRASSLAND ECOSYSTEM; SOILS; MOVEMENT; SODIUM; IRON; MANGANESE; ZINC; COPPER; COBALT; NICKEL; TERRESTRIAL ECOSYSTEMS

550
Predicted Distribution of Organic Chemicals in Solution and Adsorbed as a Function of Position and Time for Various Chemical and Soil Properties

Oddson, J.K.; Letey, J.; Weeks, L.V.; Univ. California, Riverside, CA

Proc. Soil Sci. Soc. Am. 34, 412-417; 1970

PESTICIDES; SURFACTANTS; MODEL; MOVEMENT; DIFFUSION; ORGANIC CHEMICALS; DISTRIBUTION; ADSORPTION; MASS TRANSFER

Equations describing the mass transfer of organic chemicals (such as pesticides and surfactants) through soil are presented, suing a model with the assumed relationship Delta t = Alpha (Kc-S) where S= adsorbed concentration and c and t = solution concentration and time, respectively (K and Alpha being constants); movement by diffusion was assumed to be negligible.

551
Microbiology of Soils Contaminated with Petroleum Hydrocarbons. I. Extent of Contamination and Some Soil and Microbial Properties After Contamination

Odu, C.T.

J. Inst. Petrol., London (JIPEA6), 58(562), 201-208; 1972

HYDROCARBONS; OILS; SOILS; PLANTS; MICROORGANISMS; MICROBIOLOGY; PETROLEUM

552
Effect of Continuous Application of Herbicides on the Chemical Nature of Upland Soils

Oh, W.K.; Munic. Coll. Agric., S. Korea

Han'Guk Toyang Biryo Hakhoe Chi(HTBHAY) 1973, 6(1) 9-16; 1973

HERBICIDES; SOILS; LOROX; PH; HUMUS; CALCIUM; MAGNESIUM; SODIUM; POTASSIUM; 2,4-D; LASSO; PHENYL ETHER; PHENOXIDE; SODIUM PENTACHLOROPHENOXIDE; CARBON; WEED

Soil applications of the herbicide lorox (0.15 kg/10 are), decreased the ph, organic content, calcium, magnesium, and sodium of the soil and increased potassium application of 4 other herbicides, that is, 2,4-D, lasso, 2,4,6-trichlorophenyl 4-nitrophenyl ether, and sodium pentachlorophenoxide, increased the organic carbon content in the soil. The continuous application of herbicides may alter the weed species in the field

553
Application of Isotope Techniques for Studies on Mechanisms of Land Contamination and Water Pollution

Ohmomo, Y.; Suzuki, H.; Saiki, M.

Part of Proc. Jap. Conf. Radioisotop. No. 10 (499-503); 1972, April

TRACER TECHNIQUES; WATER; ACTIVATION ANALYSIS; BROMINE; DYSPROSIUM; EUROPIUM; FLOW RATE; INLAND WATERWAYS; TRACER; CERIUM 144; CESIUM 137; CONTAMINATION; DRINKING WATER; FALLOUT DEPOSITS; RADIOACTIVE WASTE DISPOSAL; RUTHENIUM 106; SEDIMENTS; SOILS; STRONTIUM 90; COWS; FISH; IODINE 131; MILK; PLANTS; RADIONUCLIDE MIGRATION; UPTAKE; LABELLED COMPOUNDS; MERCURY; MERCURY 203; RADIOECOLOGY

554
Soil Properties and Processes in Relation to Waste Recycling and Disposal

Oldham, W.K.; Univ. of British Columbia, Canada

Presented at Conference, Land for Waste Management, Ottawa, Canada, Oct. 1-3, 1973, p. 34-39; 1973, October

WASTE RECYCLING; FILTRATION; REMOVAL; DISPOSAL; SPRAY IRRIGATION; PHOSPHATES; WASTE DISPOSAL; MICROBIOLOGY; WASTEWATER; FATE; MERCURY; SORBENT; WASTE GASES; WASTES; GASES; SOILS; RECYCLING

In papers on soil properties and processes in relation to waste recycling and disposal, the following topics are summarized: spray irrigation of secondary effluent; phosphate removal by soil in relation to waste disposal; microbiology of soil for wastewater renovation; the fate of applied mercury in soil; and soil as a sorbent and filter of waste gases.

555
Solubilization by Biochemical Means of Arsenic Bound to Iron in the Soil

Olivier, H.R.; Le Peintre, M.

Ann. Inst. Pasteu, 88, 668-671; 1955

IRON; SOILS; ANAEROBIC FERMENTATION; ARSENIC

The anaerobic fermentation or organic substances dissolves by reducing the Fe in soil and causing the As to pass into solution.

556
Content, Distribution and Forms of Iron in Soils of Western Andalusia. 3. Total and Free Iron in Relation to the Chemical Composition of the Soils

Olmedo, J.; Paneque, G.; Centro de Edafologia y Biologia Aplicada del Cuarto, Sevilla, Spain

Anales de Edafologia y Agrobiologia, 30(7/8), 633-645; 1971

DISTRIBUTION; SOILS; IRON; MOBILIZATION; IRON OXIDES

Except in a ferritic brown earth, total Fe_2O_3 in western Andalusian soils varied between 2 and 6%; free Fe (Deb) was always less than 1%. The ferritic brown earth contained 35-55% total Fe_2O_3 and 4% free Fe_2O_3. Chemical analysis showed that the content and mobilization of Fe could be related to the amount and type of total SiO_2 and the proportion of Al_2O_3 and CaO.

557
The Interaction of Humic Acids With Cations of Some Metals

Orlov, D.S.; Eroshicheva, N.L.

Vest. Mosk. Gos. Univ. Ser. Viol. Pochv., 1, 98-106; 1967

HUMIC ACIDS; METALS; CATION EXCHANGE

558
Desorption of Copper and Cobalt Cations from Chernozem and a Sod-Podzolic Soil

Orlova, L.P.; Ivanov, D.N.; Pochv. Inst. Im. Dokuchaeva, Moscow, USSR

Pochvoedenie (PVDEAZ), 2, 31-36; 1974

CATIONS; DESORPTION; SOILS; COPPER; COBALT; CHERNOZEM; PODZOL

559
Recommended Methods of Reduction, Neutralization, Recovery, or Disposal of Hazardous Waste

Ottinger, R.S.; Blumenthal, J.L.; Dal Porto, D.F.; Santy, M.J.; TRW Systems Group, Redondo Beach, Calif.

Final Report, Vol. IV, Research & Development Plans; PB-224 594/2 <REPORT NO. TRW-21485-6013-RU-00-VOL-15; Contract EPA-68-03-0089; Monitoring Agency Rept. No. EPA-670/2-73-053-0; F; 109 p.; 1973, August

MINE WASTES; LIMESTONE; HAZARDOUS MATERIALS; WASTE DISPOSAL; SOLID WASTE DISPOSAL; LIQUID WASTE DISPOSAL; PESTICIDES; INCINERATORS; INDUSTRIAL WASTES; RECLAMATION; METAL INDUSTRY; CEMENTS; ADHESIVES; POLYMER; SLUDGE DISPOSAL; SOILS; ARSENIC; MERCURY; FLUIDIZED BED; VAPORIZATION; DECONTAMINATION; IRON; ALUMINUM; TITANIUM; HYDROGEN CHLORIDE; CHLORINE; HYDROGEN; CHLORIDES; WATER TREATMENT; SULFUR; SULFUR OXIDES; AIR FLUE GASES; CLAY; HEAVY METALS; STREAMS; WASTES

This volume presents more detailed information for some of the projects proposed and summarized in Chapter 6 of Volume I. The projects described herein include cementation processes, both inorganic and organic, sulfur sequestering, arsenic removal from soil, recovery of alumina from clay and sulfur oxide scrubbing wastes, characterization of incineration parameters for the safe disposal of pesticides, new chemical concepts for use of waste pesticides, and isolation of mercury and other heavy metals from dilute waste streams.

560

Cadmium Residues in the Environment

Page, A.L.; Bingham, F.T.; Dep. Soil Sci. Agric. Eng., Univ. California, Riverside, Ca

Residue Rev.(RREVAH) 1973, 48,() 1-44; 1973

REVIEW; CADMIUM; FOODS; RESIDUES; HUMANS; ANIMALS; FRESHWATER; MARINE WATER; INDUSTRY; AQUATIC ECOSYSTEMS; ELECTROPLATING; ALLOYS; PIGMENTS; ORE; FRESHWATER; EMISSIONS

Cadmium residues in the environment are of concern because of known toxicities of it and its compounds to human beings and animals. During the past decade world production of cadmium averaged 12,420 metric tons a year, with the U.S. as its largest producer and consumer. Practically all the cadmium consumed is used in electroplating, pigments and chemicals, and in alloys. Concentration in surface soils in close proximity to industries which process cadmium containing ores are usually high. Concentrations in fresh and marine waters rarely exceed a few g/l. In analyzing cadmium residues in the environment, it appears that emissions from industrial operations account for the largest single source.

561

Lead Quantities in Plants, Soil and Air Near Some Major Highways in Southern California

Page, A.L.; Ganje, T.J.; Joshi, M.S.

Hilgardia 41 (1). 1971 1-31.

SOILS; LEAD; PLANTS; AIR; HIGHWAYS

562

Sanitary-Hygienic Evaluation of Indistrial Emissions by a Zinc-Lead Combine

Pakhotina, M.S.; Eastern-Kazakstan Regional Sanitary Epidemiological Station

Part of B.S. Levine (Ed.), U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol 3, 256+ p. (93-6); 1960, May

INDUSTRIAL EMISSIONS; METALLURGICAL WORKS; AIR; SULFUR DIOXIDE; LEAD; ZINC; COPPER; ARSENIC; SANITARY CLEARANCE ZONES; SULFURIC ACID; SMELTERS; SOILS; PLANTS; TREES; LEAVES; LEAF WASHINGS; MAXIMUM ALLOWABLE CONCENTRATION; PH

Industrial discharges of the lead-zinc combine heavily polluted the atmospheric air with SO(2), lead and arsenic at all distances from the combine at which samples were taken. The degree of soil and plant pollution with lead and arsenic over the three years of the combine's operation considerably exceeded the content of lead and arsenic in the soil and on plants of the control region. Under such pollution conditions the prescribed sanitary clearance zone of 1000 meters proved inadequate as a sanitary protection measure. Steps should be taken for the elimination of all unorganized technological and ventilation emissions of the combine and for the installation of more effective sanitary gas purifiers. Under industrial air and soil pollution under discussion soil fertility may be seriously affected. Thus, SO(3) and sulfur dioxide permeating into the soil become converted into sulfuric and sulfurous acids which has a destructive effect on the absorbing properties of the soil; they also render the calcium salts soluble, so that they easily leach out of the cultivable soil layers. According to M. P. Karasinskii this causes soil dust disintegration. Arsenic and lead easily accumulate in the soil and under favorable conditions of moisture and pH become transformed into soluble compounds which plants assimilate in quantities large enough to be harmful to the animal organism. A study of the soil in the smoke-affected region showed an extremely heavy pollution of its upper layers with lead and somewhat less with arsenic and H(2)SO(4), as can be seen from the data presented in Table 2. At distances between 500 to 1000 meters from the combine the vegetation suffered some damage during peak pollution caused by high concentrations of SO(2) in the atmosphere.

563

Content of Manganese, Boron, Copper, Molybdenum, and Zinc in Arable Layer of Mineral Soils of the Olsztyn Voivodship

Palecka, W.; Stacja Chem.-Roln., Olsztyn, Pol.

Rocz. Glebozn.(Roglaa) 1972, 23(2) 31-7; 1972

SOILS; TRACE ELEMENTS; MOLYBDENUM; MANGANESE; BORON; COPPER; ZINC

564

Air Pollution by Lead and Zinc in the Area of Combined Metallurgical Works and its Influence on Vegetation and Soils

Paluch, J.; Karweta, S.

Wissenschaftliche Zietschrift der Humboldt-Universitat Berlin, Mathematisch-Naturwissenschaftliche Reihe, 19, 495-497; 1970

FOLIAGE; PLANTS; AIR; LEAD; ZINC; VEGETATION; SOILS; INDUSTRIAL EMISSIONS; LEAD-ZINC METALLURGICAL PLANTS; LEAVES; ASSIMILATION

Soil and leaf samples from within 3 km of a Pb-Zn metallurgical plant were analyzed during the first 3 years of operation. Total surface Zn and Pb increased from 17 to 375 and 39 to 290 ppm while their assimilable percentage decreased, due to the alkalizing effect of oxide dusts, from 77.06 to 2.37 and 44.1 to 0.69, respectively. The increases in foliage concentrations differed between plants.

565

Vapor Losses of IPC and CIPC

Parochetti, J.V.; Warren, G.F.

Weeds, 14, 281-285; 1966

VAPOR LOSSES; IPC; CIPC

566
Selenium Status of Soils and Common Fodders in Gujarat

Patel, C.A.; Mehta, B.V.; Inst. Agric., Gujarat, India

Indian J. Agric. Sci., 40, 389-399; 1970

CLAY; PH; FODDER; GYPSUM; SELENIUM; PLANTS; SOILS

Total selenium in soil was 0.142-0.678 ppm with an average of 0.375 ppm, and water-soluble selenium was 0.051-0.121 ppm with an average of 0.C79 ppm. Water-soluble selenium was positively correlated with total selenium and clay content, and negatively correlated with scil pH. The selenium content of fodder plants was positively correlated with the water-soluble selenium content of the soil. In pot experiments, the injurious effect of application cf 2 ppm selenium was decreased by application of selenium as gypsum.

567
Metal Toxicities Arising from Industry

Patterson, J.B.E.; Agricultural Development and Advisory Service, Cambridge, England

Trace Elements in Soils and Crops, Technical Bulletin, Ministry of Agriculture, Fisheries and Food, 21, 193-207; 1971

SOILS; TRACE ELEMENTS; SEWAGE SLUDGE; WASTE DUMPS; DREDGING; SPOILS; RIVERS; ESTUARIES; EMISSIONS; AIR; CHIMNEYS; AUTOMOBILE EMISSIONS; INDUSTRIAL WASTES; METALS

Data are presented on the quantities of toxic elements in the soil arising from sewage sludge, dumps of waste, dredgings and spoil from rivers and estuaries, emissions from chimneys, vehicle exhausts and miscellaneous sources.

568
Geochemical Principles of the Distribution of Trace Elements in Soils

Pedro, G.; Delmas, A-B.; Stn. Cent. Agron., INRA, 78-Versailles, France

Annls agron., 21, 483-518; 1970

TRACE ELEMENTS; ROCKS; MINERALS; DISTRIBUTION; PEDOLOGICAL PROCESSES; GEOCHEMISTRY; SOILS; REVIEW

Trace elements in rocks and minerals, and their distribution as affected by pedological processes are reviewed with 46 references.

569
Experimental Investigations on the Behaviour of Ferric Hydrates and Amorphous Silico-Ferric Constituents Under Leaching Conditions

Pedro, G.; Melfi, A.J.; Inst. Natn. Rech. Agron., Versailles, France

Pedologie, Gand, 20, 5-33; 1970

HAEMATITE; FERRIC HYDRATES; FERRIC GELS; SILICO-FERRIC GELS; IRON; SILICON; LEACHING;: OXIDES; SOIL-FORMING PROCESSES; TRANSFORMATION

Under free-draining conditions in laboratory experiments with de-ionized CO2-free or CO2-unsaturated water, ferric and silico-ferric gels were unstable and changed early into crystalline oxides (haematite). With a solution containing 200 mg/l SiO2, even under strong leaching conditions, the chemical and mineralogical nature of the gels were unaltered. Results are discussed with reference to soil-forming processes.

570
Kinetics of the Decomposition in the Soil of C14-Labeled Urea as a Function of the Soil Moisture Content, the Introduction of Pesticides and Lime, and Soil pH

Pel'tser, A.S.; Timiryazev Agr. Acad., Moscow, USSR

Agrokhimiya, 10, 32-37; 1972

SOILS; TRACER; SOIL MOISTURE; PH; LIME; ATRAZINE; TRICHLORFON; MERCURY CHLORIDE; COPPER NITRATE; SILVER NITRATE; DECOMPOSITION; UREA

The effects of soil moisture content, soil pH, lime, atrazine, trichlorfon, mercury chloride, copper nitrate, and silver nitrate were studied on the rate of decomposition of C14-labeled urea in a laboratory test. The presence of atrazine, trichlorfon, copper nitrate, silver nitrate, and mercury chloride in the soil reduced the decomposition rate of urea. Two hundred mg of atrazine per kg of soil increased the time required (from 55 to 75 hours) for the decomposition of 10 mg of urea per 100 g of soil with 60% moisture content, a temperature of 18 C, and a pH value of 6.7. An equal dose of trichlorfon inhibited the total decomposition of urea in soil after 36 hours, by which time 80% of the total urea introduced was decomposed.

571
Distribution of Cadmium, Cobalt, Copper, Iron, Manganese, Nickel, Lead and Zinc, in Dissolved and Particulate Solids From Two Streams in Tennessee

Perhac, R.M.

J. of Hydrol., 15, 177-186; 1972

DISTRIBUTION; CADMIUM; COBALT; COPPER; IRON; MANGANESE; NICKEL; LEAD; ZINC; STREAMS; DISSOLVED SOLID S; PARTICULATES

572
A Rapid Method of Evaluating the Zinc Status of Coastal Plain Soils

Perkins, H.F.

Commun Soil Sci Plant Anal 1(1), 1970, 35-42

CORN; ATOMIC ABSORPTION; ZINC; COASTAL PLAINS; SOILS

573
Movement of Water-Borne Cadmium and Hexavalent Chromium Wastes in South Farmingdale, Nassau County, Long Island, New York

Perlmutter, N.M.; Lieber, M.; Frauenthal, H.L.

U.S. Geol. Surv., Profess. Papers 475-C, C179-C184; 1963

MOVEMENT; CADMIUM; HEXAVALENT CHROMIUM; CHROMIUM; WATER; INDUSTRIAL EFFLUENTS

574
The Circulation of Pollutants in the Biosphere

Pesson, P.; Inst. Nat. Agronom., Paris

Econ. Med. Anim., 14/1, 3-10; 1973

DISPERSION; TROPHIC LEVELS; CIRCULATION; TRANSPORT; TERRESTRIAL ECOSYSTEM; AQUATIC ECOSYSTEMS; PESTICIDES; RADIOACTIVITY; BIOSPHERE; BIOTRANSFORMATION; FOOD CHAINS

The circulation of pollutants occurs mainly through two different yet complementary routes. Firstly, pollutants may be transported physically in their gaseous, solid or disolved state which lead to their progressive dispersion. Secondly, they may be transported by biologic means, using the extremely complex trophic networks which unite the organisms of terrestrial and aquatic ecosystems. The functional nature and environmental effects of these two routes of pollution circulation are examined and discussed, with particular attention to the transport of pesticide and radioactive pollutants.

575
Vegetation and Metal Toxicity in Relation to Mine and Mill Wastes. An Annotated Bibliography Useful in Evaluating Available Literature

Peterson, H.B.; Monk, R.

Circ. Utah Agric. Exp. Stn, 148, 75 p.; 1967

VEGETATION; BIBLIOGRAPHY; MINING; MILLS; METALS; INDUSTRIAL WASTES; REVEGETATION

576
Leachates Quality from Acidic Mine Spoil Fertilized with Liquid Digested Sewage Sludge

Peterson, J.R.; Gschwind, J.; Research and Development Dept., Metropolitan Sanitary District of Greater Chicago, Chicago, IL

J. Environ. Quality, 1 (4), 410-2; 1972

MINE SPOILS; ACID MINE DRAINAGE; PH; SLUDGE; SEWAGE SLUDGE; SULFATES; ZINC; MAGNESIUM; ALUMINUM; IRON; LEACHATES; NITRIFICATION; WATER-HOLDING CAPACITY

Leachate quality from spoil material was upgraded by incorporating lagooned sewage sludge into the spoil mass. There was an immediate increase in pH, which can go to the alkaline side with higher sludge rates. Important reductions occurred with aluminum (up to 99%), iron (up to 80%), soluble salts (up to 41%), and total acidity (up to 17%), as demonstrated by column 4 (61 metric tons solids/hectare). But NH3-N, magnesium, and phosphorus were greatly increased in leachate from the sludge treated spoil columns. Zinc may be mobilized from spoil material if the sludge treated layer has a pH less than 5. Percolate from a sludge-spoil layer which passed through additional spoil material became very similar to spoil material leachate. This shows that the ameliorating effects are due to and restricted to the sludge treated layer. Consequently, if the aquifer under a spoil region were separated from sludge-treated spoils by untreated spoil material, only a slight change in water quality would be expected; NH3-N, SO4 minus2, and magnesium concentrations would probably increase. Successful establishment of plant growth on acidic spoils would necessitate incorporation of sludge throughout the root zone. Nitrification of sludge NH3 indicates that conditions may be made favorable with sludge to support plant life. The greater net infiltration (calcium 10%) of the sludge treated columns indicates that there would be less runoff with subsequent silting and acid pollution of contiguous soil and water resources; increased infiltration would accelerate leaching of salts and acids from the upper spoil profile.

577
Mercury Hazards in the Coke Byproduct Industry

Petrova, N.I.; Eremeev, A.D.

Gig Tr Prof Zabol, 16(11), 1972 (Recd 1973), 45-46

HUMANS; WATER; AIR; SOILS; URINE; COKE BYPRODUCT INDUSTRY; MERCURY; OCCUPATIONAL EXPOSURE

578
The Geochemical Ecology of Plants

Petrunina, N.S.

U.S. Gov. Res. Dev. Rep., 70(22), 39(1970); Tran. of Publ. Abiogenez I Nachanyye Studii Evolyutsii Zhizni Moscow Nauka Press, 1968, 202-206, N70-36133; 1968

SOILS; METALS; MUTATIONS; PLANTS; GEOCHEMICAL ECOLOGY

579
Mercury Content of Rocks, Soils, and Stream Sediments

Pierce, A.P.; Bothbol, J.M.; Learner, R.E.

Part of Mercury in the Environment, Geological Survey Profess. Paper 713, U.S. Government Printing Office, p. 14-17; 1970

MERCURY; ROCKS; SOILS; STREAMS; SEDIMENTS

580
Effects of Different Aqueous Buffers on the Zinc Extractability of Dithizone

Pietz, R.I.; Adams, R.S.; MacGregor, J.M.

Soil Sci. Soc. Amer. Proc., 34(4), 698-699; 1970

SOILS; NUTRIENTS; AVAILABILITY; ZINC; AQUATIC BUFFERS; BUFFERS; DITHIZONE

581

The Specific Adsorption of Copper by Clay Minerals and Soil Fractions

Plessis, S.F.; Burger, R.D.

Agrochemophysica, 3(1), 1-10; 1971

CLAY; ADSORPTION; PH; COPPER; SOILS

Soil clays adsorbed about 1100 microgram Cu/g of clay, as compared with 300 microgram/g of pure clay. The silt fraction also adsorbed Cu. Adsorption capacity was influeced by pH and the presence of other cations.

582

Behavior of Mercury Compounds in Soils: Accumulation and Evaporation

Poelstra, P.; Frissel M.J.; Van Der Klugt, N.; Tap, W.; Association Euratom-ITAL, Institute for Atomic Sciences in Agriculture, Wageningen, the Netherlands

Part of FAO/ IAEA/WHO Symposium on Comparative Aspects of Food and Environmental Contamination, Held at Helsinki, Finland, 1973, SM/175/46, 9p.; 1973

MERCURY; SOILS; FUNGICIDES; ATOMIC ABSORPTION SPECTROPHOTOMETRY; NEUTRON ACTIVATION ANALYSIS; MERCURY 203; METHYLMERCURY; DIMETHYLMERCURY; MERCURY CHLORIDE

The background mercury concentration in the top 20 centimeters of 10 uncontaminated European soils was 0.02 to 0.10 ppm (average 0.07); the concentration was lower in the 20-100 cm. depth. In the bulb growing area (where mercury fungicides had been used for many years) the concentration was about twice as high over the whole ploughing depth. The rate of accumulation is low; the rate of leaching is low, as is the rate of volatilization. Still higher values (up to 10 ppm) are found in areas flooded by the heavily polluted Rhine river. In some areas reclaimed 50 years ago, the soil was evidently contaminated then and still is. Evidently, there is some mercury being deposited with rain in almost all areas: this comes from fossil fuels, smelters, etc. and is higher near industrialized areas. Experiments showed that dimethyl mercury evaporated quickly from soils; mercury as the chloride hardly at all and as CH3 Hg Cl or mercury metal very slowly (1/2 to 1 percent in about 6 months from the experimental soil columns kept at 20 degrees C). Continuous or interrupted leaching may have affected the volalization slightly; the former increasing it for CH3HgCl and decreasing it for metallic mercury.

583

Accumulation and Distribution of Mercury in Dutch Soils

Poelstra, P.; Frissel, M.J.; Van Der Klugt, N.; Bannink, D.W.; Inst. At. Sci. Agric., Assoc. Euratom, Wageningen, Neth.

Neth. J. Agr. Sci.(NETHAW) 1973, 21(1) 77-84; 1973

MERCURY; SOILS; PASTURES; ACCUMULATION; DISTRIBUTION; CROPS; ORGANOMETALLICS; PESTICIDES; PLANTS; REVIEW

Gives results of mercury contents survey for different types of soil in Holland. Good reference source for behaviour of mercury in the ground.

584

Metabolism of Benz(a) Pyrene by the Microflora of Various Soils and by Particular Species of Micro-Organisms

Poglazova, M.N.; Fedoseeva, G.E.; Khesina, A.Y.; Mikrobiol. Akad. Nauk SSSR

Dokl. Akad. Nauk SSSR, 198, 1211-1213; 1971

BENZ(A)PYRENE; POLYCYCLIC; AROMATIC HYDROCARBONS; SOILS; INDUSTRIAL WASTES; TRAFFIC WASTE; OIL INDUSTRY PRODUCTS; MICROORGANISMS; BENZOPYRENE; BENZO(A)PYRENE; HYDROCARBONS; BAP; MICROFLORA; MICROORGANISMS

In meat-peptone broth containing benz(a)pyrene, incubation with a soil only slightly contaminated by polycyclic aromatic hydrocarbons, with a soil heavily contaminated by industrial and traffic waste, and with a soil heavily contaminated by oil-industry products and polycyclic aromatic hydrocarbons, decreased the content of benz(a)pyrene by 20, 40 and 40%, respectively. Inoculating previously sterilized soil with BACILLUS SPHAERICUS, BACILLUS MEGATERIUM MUTILATE or PSEUDOMONAS-146 quickly decomposed 48-59% of the benz(a)pyrene in the slightly contaminated and 75-86% of that in the other two soils.

585

Nonexchangable Copper Bound to Copper-Montmorillonite. 2.

Polacek, S.; Galba, J.; Univ. Agric., Nitra, Czechoslavakia

Pol'Nohospodarstvo(POLNAJ) 1973, 1(3) 177-83; 1973

MONTMORILLONITE; COPPER; BINDING; FERTILIZER

586

Retention of Chloride in the Unsaturated Zone

Pollock, S.J.; Toler, L.G.

J. Research, 2(1), 119-123; 1974, Jan.-Feb.

SODIUM; CALCIUM; SALTS; ICE; SNOW; HIGHWAYS; WATER; VEGETATION; CHLORDANE; SAND; SILT; SODIUM CHLORIDES; DISTRIBUTION; PRECIPITATION; SOILS

The use of sodium and calcium salts for melting ice and snow on highways is common in the northern U.S.; as deicing salts are dispersed they damage soil, vegetation, and water. Some of the chloride from predominantly sodium chloride deicing salts that enters the ground is retained in the unsaturated zone. In sand and silt at Chelmsford, Mass., the amount of chloride retained in the unsaturated zone to a depth of 4.6m ranged from 15-55% of the annual amount applied to highways as sodium chloride in 1965-69. Soil grain size, depth to the water table, and amount and seasonal distribution of precipitation control the amount of chloride retained in the unsaturated zone. (6 references)

587
The Effects of Trace Metals on Ground Water Quality as Influenced by Soils Reflecting Differences in Organic Matter Content and Genetic Conditions

Ponder, F.; Tuskegee Inst., Ala.

Thesis, Tuskegee Institute, Alabama; Monitoring Agency Rept. No. W74-02211, OWRR-B-028-ALA(4); Proj. OWRR-B-028-ALA; 69 p.; 1971, May

TRACE METALS; GROUND WATER; SOILS; GENETIC CONDITIONS; ZINC; ABSORPTION; LEACHING; RUN OFF; WATER; DIVALENT; LEACHING

A review of literature on the correlation between organic matter and zinc content of soil and an investigation of zinc absorption using four different types of soil. These soils, which were selected to represent a wide range of organic matter contents and genetic conditions, were prepared and submitted to studies of zinc adsorption and leaching. Soil and run-off water were analyzed for zinc content. It is concluded that organic matter is mainly responsible for the retention of zinc or other divalent metal by forming stable complexes. Groundwater having passed through soils high rather than low in organic matter will contain lesser quantities of divalent cations.

588
Mobile Forms of Silica, Manganese, and Sesquioxides in Light Sierozems of the Golodnaya Steppe

Popova, T.P.

Nauch. Tr., Tashkent. Gos. Univ. (NTGLAZ) 1971, No. 416,() 62-6; 1971

SOILS; MANGANESE; SESQUIOXIDES; SILICA; ALUMINUM OXIDE; IRON; MOBILITY

589
Retention and Volatilization of Lindane and DDT in the Presence of Organic Colloids Isolated from Soils and Leonardite

Porter, L.K.; Beard, W.E.

J. Agr. Food Chem., 16, 344; 1968

LINDANE; RETENTION; VOLATILIZATION; DDT; ORGANIC COLLOIDS; SOILS; LEONARDITE

590
The Distribution and Nature of Arsenic in Soils of the Bathurst, New Brunswick, District

Presant, E.W.; Tupper, W.M.

Econ. Geol, 61, 1760-767; 1966

DISTRIBUTION; ARSENIC; SOILS

591
A Review of Transuranic Elements in Soils, Plants, and Animals

Price, K.R.; Battelle Northwest Lab., Richland, WA 99352

J. Environ. Qual., 2(1), 62-66; 1973

DISTRIBUTION; FATE; TERRESTRIAL ECOSYSTEM; RADIONUCLIDES; TRANSURANIC ELEMENTS;: SOILS; PLANTS; ANIMALS; ORGANIC COMPLEXES; CHELATION; MOBILITY; OXIDATION STATE; REDUCTION; INGESTION; ASSIMILATION; UPTAKE; REVIEW; NEPTUNIUM; PLUTONIUM; AMERICIUM; CURIUM; HALF-LIFE; BYPRODUCTS; NUCLEAR REACTORS; TRANSPORT

Published information concerning the distribution and fate of Np, Pu, Am, and Cm in terrestrial ecosystems is reviewed; areas needing further study are identified. In the final analysis of environmental quality, radionuclides with very long half lives will become increasingly important to humans as they continually constitute a greater proportion of environmental radioactivity. The transuranic elements are the most hazardous radionuclide by-products of nuclear reactor operations. The relatively few studies conducted indicate that transuranic elements do not remain in solution in soils, plants or animals, but organic complexes and chelation greatly enhance mobility. The elucidation of natural organic comlexes and chelating agents was not attempted. Oxidation state also influences mobility, but possible biological mechanisms permitting oxidation or reduction remain uninvestigated. Ingestion is the most important transfer mechanism in ecosystems, but assimilation of transuranics from natural food sources is mostly unknown. Evidence in the literature suggests 3 possible mechanisms leading to the observed increase in plant uptake with time: the formation of organic complexes or chelates, a buildup of radionuclide concentration at root surface or the slow but continual uptake by perennial plants. Each of these mechanisms deserves further study.

592
Plant Ecology of Serpentine. 2. Influence of a High Magnesium/Calcium Ratio and High Nickel and Chromium Levels in Some British and Swedish Serpentine Soils

Procter, J.

J. Ecol. 59(3), 827-842; 1971

MAGNESIUM; CALCIUM; NICKEL; CHROMIUM; SERPENTINE SOILS; PLANTS

593
Effect of the pH and Salt Concentration on Zinc Sorption by Soils

Prokhorov, V.M.; Gromova, E.A.

Sov. Soil Sci. (Engl. Transl. Pochvovedenie), 3(6), 693-699; 1971

PH; SALT; ZINC; SORPTION; SOILS; ORGANIC MATTER

594

Consequences of Trace Element Contamination of Soils

Purves, D.: Edinburgh School of Agriculture, Edinburgh, Scotland

Environmental Pollution, 3, 17-28; 1972

TRACE ELEMENTS; URBAN; RURAL; SOILS; PLANTS; FOODS; SPECTROGRAPHY; BORON; COPPER; LEAD; ZINC; SOOT; ASH; COMPOST; SEWAGE SLUDGE; AVAILABILITY; UPTAKE; LEACHING; NITROGEN REQUIREMENTS; CELLULOSE; FERTILIZERS; LETTUCE; CABBAGES; BEANS; PEAS; POTATOES; HYPOCHLOROSIS; CHROMIUM; NICKEL; HERBAGE; FLUORIDES; HIGHWAY PROXIMITY; SURFACE CONTAMINATION; OATS; RADISHES; CLOVES; GRASSES; PERSISTENCE; AIR

The chemical composition of the bulk of the food we eat has been profoundly modified by the intensification of the means of food production and as a result of the general contamination of the environment. Contamination of the soil in urban and industrial areas with potentially toxic trace elements is an important aspect of environmental pollution which can affect the composition of food. Contamination of soils with elements such as copper, lead and zinc appears to be largely irreversible and sources of this kind of contamination are discussed. Evidence is presented that the trace element content of plants grown on contaminated soils can be enhanced and that deleterious effects on plant growth are possible.

595

Selenium in Ground and Surface Waters

Quentin, K.E.; Feiler, L.

Vom. Was., 34, 19-30; 1967

ANALYSIS; SELENIUM; WATER; GROUND WATER

Investigation into occurrence and behaviour of selenium compounds in water and various types of water treatment, including relation of selenium content to the hydrogeology of the area.

596

Arsenite Oxidation in Soil

Questel, J.H.; Scholefield, P.G.

Soil Sci., 75, 279-285; 1952

ARSENITE; OXIDATION; SOILS

597

Arsenite Oxidation in Soil

Questel, J.H.; Scholefield, P.G.

Soil Science, 75, 279-285; 1953

ARSENITE; MICROORGANISMS; SOILS; ADSORPTION; SODIUM ARSENATE; ARSENIC

Arsenite undergoes biological oxidation to arsenate in soil. On repeated perfusion of a soil with arsenite, conditions are obtained under which arsenite is oxidized at a constant rate. Addition of sodium azide to soil eliminates the oxidation of arsenite. The presence of sulfanilamide also inhibits arsenite oxidation in soil, but adaptation rapidly occurs. Arsenate per se has no deleterious effect on arsenite oxidation. Arsenite is adsorbed by soil, the extend of adsorption at pH 7 being directly proportional to the concentration of arsenite. A small but constant amount of arsenite is apparently bound irreversibly to the soil. The final rates of arsenite oxidation by soils repeatedly perfused with arsenite depend on the pH of the perfusate and the concentration of arsenite. After many perfusions of sodium arsenite at pH 7 the oxidizing ability of an enriched soil decreases. Soils enriched with arsenite-oxidizing organisms are capable of enrichment also with nitrifying organisms. These organisms apparently develop at separate sites on the soil surfaces. This accounts for the fact that repeated alternate perfusions with ammonium ions and with sodium arsenite result in rates of nitrification and arsenite oxidation almost identical with those of soils exposed to either substrate alone. The extents of oxygen uptake of enriched soils in the presence of sodium arsenite were measured manometrically; the amounts were those predicted for oxidation to arsenate.

598

Plant Uptake of Soil and Atmospheric Lead in Southern California

Rabinowitz, M.

Chemosphere, 1(4), 175-80; 1972

PLANTS; SOILS; AIR; ATMOSPHERE; UPTAKE; LEAD

599

Soil Organic Matter-Metal Complexes: 6. Stability Constants of Zinc-Humic Acid Complexes at Different pH Values.

Randhawa, N.S.; Broadbent, F.E.

Soil Sci., 99, 362-336; 1965

ZINC; HUMIC ACIDS; SOILS; ORGANIC MATTER; STABILITY CONSTANTS; COMPLEXES; PH

600

Zinc, Copper, and Cobalt Status of Punjab Soils

Randhawa, N.S.; Kanwar, J.S.; Punjab Agric. Univ., Ludhiana, India

Soil Sci., 98, 403-407; 1964

ZINC; COPPER; COBALT; ADSORPTION; SOILS; SOIL COMPOSITION

Contents in 7 profiles representing all climatic regions from moist to arid vary from 18 to 97.5 parts per million (average 54.5 parts per million) Zn, 6.6 to 36.4 (average 22.1 parts per million) Cu, and 4.4 to 32.5 parts per million (average 20.2 parts per million) Co. The elements increase with increase in silt and clay contents of the soils.

601
Soil Organic Matter-Metal Complexes: 5. Reactions of Zinc with Model Compounds and Humic Acid

Randhawa, N.W.; Broadbent, F.E.

Soil Sci., 99, 295-300; 1965

HUMIC ACIDS; SOILS; ZINC; METALS; ORGANIC MATTER; HUMUS

602
Sorption of Lead by Hydrous Ferric Oxide

Rao Gadde, R.; Laitinen, H.A.; Sch. Chem. Sci., Univ. Illinois, Urbana, IL

Environ. Lett. (EVLTAX) 5(4) 223-35; 1973

LEAD; SORPTION; IRON; OXIDE; SOILS; FERRIC OXIDES; PH; SEDIMENTS; RUNOFF; ACID MINE DRAINAGE; ADSORBTION; HYDROUS FERRIC OXIDE; HYDROUS MANGANESE OXIDES; ADSORPTION

Sorption of lead on synthetic hydrous ferric oxide as a function of lead concentration and pH is described. The environmental consequences of reversible lead sorption with pH are discussed. Hydrous ferric oxide, whether in soils, sediments, or acid mine runoffs can adsorb large amounts of lead at a favorable pH and release it quickly as the pH decreases.

603
The Arsenic Content in Soil Following Repeated Applications of Granular Paris Green

Rathburn, C.B.

Mosquito News, 26(4), 537-39; 1966

ARSENIC; GRANULAR PARIS GREEN; SOILS; PESTICIDES

604
Cadmium: Production, Use and Residues in the Environment in Finland

Rautapa, J.; Advis. Comm. Poisons, Finland

Kem. Teollisuus (KETEA9), 30(10), 465-7; 1973

REVIEW; CADMIUM; RESIDUES; CADMIUM PRODUCTION

605
Sorption of Mercury by the Inorganic Constituents of the Sediment

Reimers, R.S.; Krenkel, P.A.; Eagle, M.; Battelle Columbus Lab.; Vanderbilt University, Nashville, TN

Part of International Mercury Congress, May 6-10, 1974, University of Barcelona; 1974, May

FINE SANDS; APATITE CALCITE; SILICA; MERCURY; SAND; CLAY; MINERALS; ADSORPTION; CHLORIDES; PH; HUMATE; OXIDES; SULFIDE; METHYLMERCURY; COMPLEXING AGENTS; REDUCTION; MERCURIC CHLORIDE; MONTMORILLONITE; ILLITE; UPTAKE; SEDIMENTS

With the advent of the mercury "scare", there has been a definite need to predict the quantitative adsorptive capacity of natural inorganic sediments. The inorganic constituents have been divided into three groups, sands, clays, and miner als. The adsorption of mercury by sands and clays has been found to be effected by various abiotic parameters in the environment. The adsorption of methyl and inorganic mercury by sands was found to be inhibited by chlorides, depended on pH, inhibited by the dissolved oxygen, and effected by the particle size of the sands. The capacitance for mercury by clays was found to be inhibited by chlorides and humates, and to be amphoteric for various clays at fluctuating pH's. Both oxide and sulfide minerals appeared to have a high tendency to adsorb inorganic mercury, but since methylmercury has a low affinity for oxygen, only the sulfide minerals will adsorb methylmercury. The degree of mercury adsorption by oxide minerals was found to be a function of the oxide's solubility in aqueous solutions. The minerals' adsorptive capacity for both methyl and inorganic mercury was inhibited by excess sulfide, chlorides, complexing agents, reducing agents, and dissolved oxygen (enhanced oxide mineral adsorption). The order of mercuric chloride adsorption by minerals is illustrated below: sulfide minerals greater than Fe(2)O(3) and MnO(2) greater than apatite calcite greater than silica. The inorganic constituents of the sediment have a great affinity for both inorganic and methylmercury, and amazingly under aerobic conditions, the three dimensional clays, montmorillonite and Illite, have been found to have the greatest capacity for methylmercury of the natural sediments. The order of uptake of both inorganic and organic mercury by inorganic constituents of the natural sediment is elucidated below: For mercuric chloride, HgCl(2). sulfide minerals greater than illitegreater than reduced sands greater than montmorillonite greater than oxide. Minerals greater than fine sands and kaolinite. For methylmercuric chloride, CH(3)HgCl. sulfide minerals greater than illitegreater than montmorillonite greater than fine san ds.

606
A Hierarchy of Models for the Behavior of Mercury in the Ecosystem

Reiniger, P.; Frissel, M.J.; Poelstra, P.; Beek, H.

Part of Welsh, C.N. (Ed.), International Atomic Energy Agency Proceedings Series. Nuclear Techniques in Environmental Pollution, Symposium, Unipub, Inc., New York, NY, (p. 407-414) 810p.; 1971

CHROMATOGRAPHY; TRANSPORT; SOILS; RADIOACTIVITY; MODEL; MERCURY; MODEL ECOSYSTEM; ECOSYSTEMS

607
Clay Mineral Differential Thermograms as Affected by Fired Asbestos

Beneau, R.B.; Carlisle, V.W.

Soil Crop Sci. Soc. Fla. Proc., 30, 315-320; 1971

CLAY; ASBESTOS

608
Application of Thermal Atomization to the Determination of a Variety of Trace Elements in Soils and Rocks

Riandey, C.; Pinta, M.; Lab. Spectrogr., Orstom, Bondy, France

Analusis, 2(3), 179-185; 1973

SOILS; ANALYSIS; TRACE ELEMENTS; ROCKS; CHROMIUM; SILVER; COPPER; LEAD; ZINC; ATOMIC ABSORPTION; ATOMIZATION; GEOLOGY; THERMAL ATOMIZATION; DETERMINATION

609
Adsorption of Copper on Quartz

Richardson, P.W.; Hawkes, H.E.

Geochim. Cosmochim. Acta., 15, 6-9; 1958

COPPER; QUARTZ; ADSORPTION; MINERALS

610
The Persistence of Heavy Metals in Soils and Natural Vegetation Following the Closure of a Smelter

Roberts, T.M.; Goodman, G.T.; Department of Botany, University College of Swansea, Swansea, Wales; Institute of Environmental Sciences and Engineering, University of Toronto, Toronto, Canada; Department of Applied Biology, Chelsea College, University of London, London, England

Part of Hemphill, D.D. (Ed.), Seventh Annual Conference on Trace Substances in Environmental Health, Held at Memorial Union, University of Missouri-Columbia, Columbia, MO, June 12-14, 1973; 1973

SLAG; VEGETATION; FALLOUT; LEAVES; ZINC; LEAD; CADMIUM; NICKEL; CONCENTRATION; LEACHING; COPPER; PERSISTENCE; SMELTERS; SOILS; GRASSES; SEASONAL VARIATIONS; EPIPHYTIC MOSS; BIOINDICATORS; TAILINGS; REFINERIES; MOSSES; AIR

The lower Swansea Valley in South Wales was the center of Britain's copper and zinc smelting industry in the nineteenth century. It is now an area of extreme industrial dereliction, with numerous slag heaps and tailing dumps. It is virtually devoid of vegetation. Metal levels downwind of the smelter were high, but the relative contributions to this of the old spoil heaps, as opposed to the remaining producing zinc-lead smelter and nickel refinery, were difficult to elucidate. Closure of the smelter in May, 1971, however, resulted in a gradual, but marked decrease of zinc, lead and cadmium fallout downwind. Shutdown of the smelter coincided with an accelerated decrease of the heavy metal content of leaves of the grass Festuca rubra. Lead levels decreased by a factor of ten, i.e., from 1500 to 150 ppm dry weight and cadmium levels fell from 48 to 11 ppm. In the following autumn the zinc, lead and cadmium levels rose by only a factor of two as a new, much lower pattern of seasonal fluctuations emerged. In contrast, the nickel content of Festuca leaves rose following the smelter shutdown, being 26 ppm in January, 1972 compared to 20 ppm in January, 1971. In contrast to Festuca, the zinc, lead and cadmium content of the epiphytic moss, HYPNUM CUPRESSIFORME VAR. FILIFORME fell only slowly, which indicates that this 'monitor' species may reflect a pollution episode long after the emission has ceased. The small variation of metal levels in Hypnum due to the annual growth cycle suggests that epiphytic mosses are useful monitors of atmospheric metal fallout. In marked contrast to the rates of fall in metal concentration of Festuca; the available soil levels decreased only slowly throughout the sampling period and showed no seasonal pattern. Zinc levels decreased the most, e.g., from 1554 ppm in April, 1971 to 1028 ppm in April, 1972. Rates of leaching were calculated, which suggested a return to 'background' levels for lead and cadmium within a period of 3-4 years. However, copper levels were still elevated in soils near a copper smelter which had closed in 1925. This persistence in soils may still present a problem.

611
Effect of Foundry Smoke at Freiberg and Halsbruecke on the Trace-Element Content in Soil

Roesler, H.J.; Beuge, P.; Mueller, E.

Bergakademie, 21, 386-397; 1969

FOUNDRY SMOKE; SMOKE; VALLEYS; SLOPES; HILLSIDES; CHIMNEYS TRACE ELEMENTS; LEAD; ZINC; ARSENIC; TIN; SILVER; SOILS

The regional distribution of Pb, Zn, Sn, As and Ag were evaluated and plotted from 450 spectral analyses of soil samples from an area of 500 sq km. Foundry smoke from Freiberg, Halsbruecke and Moldenhuetten appreciably affected trace-element content but the effect was confined to the A(1) horizon. Smoke of the Freiberg type could affect the trace-element content of an area over 200 sq km. The weather slopes of hillsides and major valleys could be particularly affected, depending on chimney heights.

612
Model Experiments on the Downward Migration of Artificial Radioactive Materials in Soils

Rohleder, K.; Staatl. Chem. Untersuch. Amt, Braunschweig

Kerntechn. Atomproaxis, 15(7), 301-305; 1973

SOILS; RADIOIOSTOPES; CESIUM; ANTIMONY; CESIUM 137; ANTIMONY 125; PRECIPITATION; VEGETATION; GROUND WATER

The lower the exchange capacity of a particular soil and the lower the distribution coefficient of a particular nuclide the more easily will the nuclide penetrate into the deeper layers of that soil. In contrast to other nuclides, Sb 125 is practically not retained by soil at all. The distribution of various nuclides in the soil does not depend on the time over which a given amount of precipitation percolates through the soil, but acidity of the water reduces elution. The depth of penetration of nuclides into soil is strongly affected by the vegetation cover. For example, Sb 125 remains much longer in the topmost soil layer in the presence of a cover of moss. No indication was found, however, of any enrichment by microorganisms living in the topmost soil layer. The rate of downward migration in unworked soil is particularly slow in the case of the long lived nuclide Cs 137, so that the dose rate of this nuclide on the surface of the soil hardly changes after contamination. This effect is further intensified by a vegetation cover, so that this nuclide may present a hazard of ground water contamination.

613
Lead Uptake by Selected Tree Seedlings

Rolfe, G.L.; Dep. Forest., Univ. Illinois, Urbana, Ill.

J. Environ. Qual., 2(1), 153-157; 1973

TREES; LEAD; ABSORPTION; SOILS; PHOSPHORUS; UPTAKE

614
Modeling Lead Pollution in a Watershed--Ecosystem

Rolfe, G.L.; Chaker, A.; Melin, J.; Ewing, B.B.; University of Illinois, Urbana, IL 61801

Journal of Environmental Systems, 2(4), 339-349; 1972, December

LEAD; MODEL; TRANSPORT; ACCUMULATION; WATERSHEDS; ECOSYSTEMS; CROPS; PASTURES; FORESTS; AUTOMOBILE EMISSIONS; AIR; WATER; SOILS; CONCENTRATION; PLANTS; ANIMALS; SEASONAL VARIATIONS; SPATIAL LOCATION

An interdisciplinary study is currently in progress at the University of Illinois at Urbana-Champaign under a grant from the National Science Foundation RANN Program. Objectives of the study include understanding and modeling the movements and effects of heavy metals (initially lead) in the environment. A model has been constructed which simulates the movements and predicts the accumulation points of lead in a 76-square mile watershed-ecosystem in Champaign County, Illinois. The model includes components of both aquatic and terrestrial ecosystems and represents the ecosystem by a network of nodes and branches where the nodes represetn the components of the ecosystem in a general sense and the branches indicate possible transport mechanisms between nodes. Results of a two year simulation using a network of 36 nodes and 121 branches is presented. The model provides a method for the study of pollutant transport and accumulation in ecosystems.

615
Effects of Beryllium in Plants and Soil

Romney, E.M.; Childress, J.D.

Soil Sci., 100, 210-217; 1965

BERYLLIUM; PLANTS; SOILS

616
The Effect of Arsenic Trioxide on the Growth of White Spruce Seedlings

Rosehart, R.G; Lee, J.T.

Water Air Soil Pollut, 2(4), 439-443; 1973

SOILS; ARSENIC TRIOXIDE; TREES; SPRUCE; SEEDLINGS; PHYTOTOXICITY

617
Selenium

Rosenfeld, I.; Beath, O.A.

Academic Press., N.Y., 411 p.; 1964

SELENIUM

618
Arsenic Fixation in Relation to the Sterilization of Soils with Sodium Arsenite

Rosenfels, R.S.; Crafts, A.S.

Hilgardia, 12(3), 203-229; 1939

ARSENICS; FIXATION; STERILITY; SOILS; SODIUM ARSENITE; ARSENIC FIXATION

619
Behavior of Cadmium in the Oxidation Zone

Roslyakov, N.A.

Geol. i Geofiz., Akad. Nauk SSSR, Sibirsk. Otd., (2), 126-9; 1962

GEOCHEMISTRY; CADMIUM; OXIDATION; ZINC; GALENA; SPHALERITE; SPECTROGRAPHY; GALENA; PYRITE; CHALCOPYRITE; IRON; MAGNESIUM; MANGANESE; TITANIUM; PELITIC; SILTSTONE; LAVAS; BRECCIA; LEAD; COPPER; CARBONATES; ROCKS; LIMONITE; HYDROXIDES; MIGRATION; ORE

Under endogenic conditions, cadmium is bound to zinc and in galena-asphalerite ore cadmium is concerned only in sphalerites. Spectral analysis detected no cadmium in galena, pyrite, and chalcopyrite from the same ore. The light-colored variety of sphalerite, as a rule, contains considerably more cadmium than brownish and dark-gray sphalerites which are usually enriched in iron, magnesium, manganese, and titanium. The small amounts of cadmium in chalcopyrite-pyrite ores, pelitic siltstones, and lava breccias are caused by the presence of dispersed fine sphalerite. Noticeable concentrations of cadmium were also observed in lead and copper carbonate rocks, in limonites, and in rocks impregnated with iron hydroxides. But their zinc:cadmium ratio (21-35) is considerably smaller than in the secondary galena-sphalerite ores (700). The lead:cadmium ratios in these ores were 240 and 200, respectively. Therefore, cadmium in the oxidization zone has a migration ability similar to that of lead and less than that of zinc. In eluvial deposits, cadmium behaves somewhat differently. It is fixed directly over ore outcrops and is found only at 2-3 meter distance from the ore. This indicates a low migration ability of cadmium in the supergene zone. Cadmium was not found in 2074 soil analyses.

620
Movement and Accumulation of Mercury in Apple Trees and Soil

Ross, R.G.; Stewart, D.K.R.

Canada J. Plant Sci., 42, 280-285; 1962

MOVEMENT; ACCUMULATION; MERCURY; APPLE TREES; APPLE ORCHARDS; SPRAYS; PHENYLMERCURY ACETATE; RESIDUES; FOLIAGE; FRUIT; LEAVES; TRANSLOCATION; UPTAKE; ROOTS; SOILS; PERSISTENCE; APPLES; TREES

In a mature apple orchard which received 21 pre-cover sprays of phenylmercury acetate in five years and 9 sprays in two years, residues of 1.11 and 0.5 ppm mercury occurred almost entirely in the top two inches of soil. The mercury moved from the foliage to growing fruit and new leaves by translocation, but there was no uptake through the roots.

621
Copper in Soils and Plants

Rotini, O.T.; Ist. Chim. Agrar., Univ. Pisa, Pisa, Italy

Atti Simp. Int. Agrochim.(ASIAAW) 1972, 9, 291-8; 1972

REVIEW; COPPER; PLANTS; SOILS; ANIMALS

622
One-Dimensional Model of the Movement of Trace Radioactive Solute Through Soil Columns - The Percol Model

Routson, R.C.; Serne, R.J.; Battelle Pacific Northwest Laboratories, Richland, Washington

Battelle Pacific Northwest Laboratories, Report BNWL-1718, 49 p.; 1972

ADSORPTION; EFFLUENTS; ION EXCHANGE; MATHEMATICAL MODEL; MINE SHAFTS; RADIOACTIVE WASTES; SOILS; WATER; SOIL COLUMNS; PERCOL MODEL; MODEL; MOVEMENT

A mathematical model is tested on soil column experiments. It allows for adsorption of the polluting species in the soil by ion exchange.

623
What Happens in Soil-Disposal of Wastes?

Routson, R.C.; Wildung, R.E.

Ind. Water Eng., 7(10), 25-27; 1970, October

BIOCONVERSION; FILTRATION; INDUSTRIAL WASTES; ION EXCHANGE; MIXED WASTES; REVIEW; SOILS; WASTE DISPOSAL; LANDFILLS; MICROBIOLOGY

A short review of the microbiological, physical and chemical processes occurring in the soil, and interactions with industrial wastes.

624
The Measurement and Mechanism of Ion Diffusion in Soils

Rowell, D.L.; Martin, M.W.; Nye, P.H.

J. Soil. Sci. 18, 204-222; 1967

ION DIFFUSION; SOILS; DIFFUSION MEASUREMENT

625
Chemical Decomposition of Soils

Rudin, V.D.; Khristenko, G.S.

Tr. Stavropol. Sel'Skokhoz. Inst.(TSTSAA) 1970, No. 33(Vol. 2) 87-9; 1970

SOILS; CHEMICAL ASHING; CHROMIUM; MOLYBDENUM; DECOMPOSITION

626
Process for Removing Molybdenum from Aqueous Industrial Effluents and for Reducing the Level Molybdenum Toxicity.

Runnells, D.R.; Colorado Univ., Boulder. Molybdenum Project

Final Report, NSF, Washington, DC; Monitoring Agency Rept. No. 18; F; PB-224 121/4; 4 p.; 1973, October 10

MOLYBDENUM; INDUSTRIAL WASTES; PRECIPITATION; EFFLUENTS; IRON CHLORIDES; WATER; COPPER; INDUSTRIAL EFFLUENTS; WASTES; IRON; SOILS; REMOVAL; AQUEOUS MEDIA

The report describes a process for removing molybdenum from aqueous industrial effluents and for reducing the level of available molybdenum in soils in areas of molybdenum toxicity. The experiments were designed to test the removal of molybdenum from actual aqueous effluents from certain copper mines in Arizona.

627
Developing a Soil Quality Index

Rust, R.H.; Adams, R.S.; Martin, W.P.

Part of Thomas, Williams A. (Ed.). Indicators of Environmental Quality. Proceedings of a Symposium. Philadelphia, PA, Dec. 26-31, 1971. Plenum Press: New York, NY; London, England, (p. 243-247), 275 p.; 1972

SOYBEANS; CROPS; ANIMALS; MICROBIOLOGY; FERTILIZERS; HERBICIDES; PESTICIDES; INDUSTRIAL EFFLUENTS; WASTES; WATERSHEDS; SOILS; FRUIT FLY; INDUSTRIAL WASTES

628
Solubility of Manganese, Iron, and Zinc as Affected by Application of Sulfuric Acid to Calcareous Soils

Ryan, J.; Miyamoto, S.; Stroehlein, J.L.; University of Arizona, Tucson, Arizona

Plant Soil (PLSOA2), 40(2), 421-7; 1974

SULFURIC ACID; SOILS; MICRONUTRIENTS; TRACE ELEMENTS; SULFATES; IRON; MANGANESE; ZINC

629
Mercury Residues in Cereal Grains from Seeds or Soil Treated with Organomercury Compounds

Saha, J.G.; Lee, Y.W.; Tinline, R.D.; Chinn, S.H.F.; Austenson, H.M.; Canada Department of Agriculture, Research Station, Saskatoon, Saskatchewan; University of Saskatchewan, Department of Crop Science, Saskatoon, Canada

Canadian Journal of Plant Science, 50, 597-599; 1970, September

MERCURY; RESIDUES; CEREALS; GRAINS; SEEDS; SOILS; BARLEY; WHEAT; PANOGEN PX; PANOGEN 15; CONCENTRATION; MERCURY RETENTION; CONTAMINATION; GAME BIRDS; FUNGICIDES; BIRDS

The purpose of this study was to determine the mercury content of barley and wheat grains grown from treated seeds or treated soil under Canadian prairie conditions. Conquest barley seeds were treated with Panogen PX, and Manitou wheat seeds were treated with Panogen 15. The harvested grains were analyzed for mercury residues. In another experiment, Panogen PX was disked into the soil, which was seeded with Thatcher wheat about a week later. Determinations were made on mercury residues in the harvested grain and in soil samples collected after the harvest. A significant amount of mercury was found in the grain grown in soil treated with Panogen PX, and 51 to 53 percent of the mercury estimated to have been applied remained in the soil five months after application. There was no significant difference in the mercury content of wheat and barley grains, whether or not they were grown from dressed grain. Researchers concluded that the reported contamination of game birds probably results from the birds eating dressed seed left uncovered by soil in the field or elsewhere.

630
Adsorption of Urea by Some Sudan Soils

Said, M.B.

Plant Soil 36 (1) 239-242; 1972

EXCHANGE CAPACITY; CLAY; AUTOCLAVING; MERCURIC CHLORIDE; HYDROLYSIS; ADSORPTION; UREA; SOILS

631
Preliminary Study of Mercury Residues in Soils Where Mercury Seed Treatments Have Been Used

Sand, P.F.; Wiersma, G.B.; Tai, H.; Stevens, L.J.

Pestic Monit J 5 (1). 1971 32-33.

MERCURY; RESIDUES; SOILS; SEED

632
Binding of Copper, Manganese, and Zinc by Humus Substances from Peat

Sapek, A.; Inst. Melior. Uzytkow Zielonych, Falenty, Poland

Rocz. Glebozn.(ROGLAA) 1972, 23(2) 51-5; 1972

HUMIC; MICRONUTRIENTS; SORPTION; TRACE ELEMENTS; HUMATE; COPPER; MANGANESE; ZINC; PEAT; BINDING

633
Asbestos in Drinking Water

Sargent, H.E.

J. New England Water Works Assoc., 88(1), 44-57; 1974

ASBESTOS; FIBER; DISTRIBUTION; SEDIMENTATION; EROSION; FLUSHING; DRINKING WATER

Asbestos fibers were found by light microscopy to be present in thirty-two water systems tested in Vermont. Generally, there is an increase in fiber count from source to distribution, but it is not known whether the fiber increase is due principally to breaking apart, concentration through sedimentation, erosion of A.C. pipe or field tapping A.C. pipe. There is no conclusive evidence to date incriminating asbestos in water as a health hazard at presently known levels. Where flusihing of the system was instituted following sampling, the fiber count was substantially reduced. There is a need for more research in this area to establish if or at what concentration of fiber a hazard to healt exists. A standard procedure for identification and quantifying asbestos in drinking water is needed.

634
Trace Elements in Agriculture

Sauchelli, V.; Van Nostrand Reinhold Co., New York, 248 p.

; 1969

TRACE ELEMENTS; AGRICULTURE; REVIEW

635
Determination of Benzo(A)pyrene in Bitumen and Crops Grown on Bitumen-Treated Soils

Schamp, N.; Wassenhov, E.F.

Meded. Fac. Landbouwwet. Rijksuniv. Gent, 37(3), 1107-1113; 1972

CARCINOGENS; AIR; BENZO(A)PYRENE; SOILS; BITUMEN; CROPS; PLANTS; HYDROCARBONS; BAP

636
On the Sorption and Leaching of Zinc in Soils

Scharrer, K.; Hoefner, W.

Z. Pfl. Ern. Dungung, Bodenk. 81, 201-212; 1958

SORPTION; LEACHING; ZINC; SOILS

637
Reactions Between Fulvic Acid, a Soil Humic Compound and Inorganic Soil Constituents

Schnitzer, M.

Soil Sci. Soc. Amer. Proc., 33, 75-81; 1969

FULVIC ACID; SOILS; HUMUS

638
Organo-Metallic Interactions in Soils: 8. An Evaluation of Methods for the Determination of Stability Constants of Metal-Fulvic Acid Complexes

Schnitzer, M.; Hansen, E.H.

Soil Sci., 109, 333-340; 1970

ION EXCHANGE; FULVIC ACID; PH; IONIC STRENGTH; COPPER; NICKEL; COBALT; LEAD; ZINC; MAGNESIUM; MANGANESE; CALCIUM; ALUMINUM; IRON

The continuous variations method was better for determining reliable fulvic acid/metal ratios than the ion-exchange method. Each ratio, however, should be checked by at least 2 different methods. With pH increase from 3 to 5 and lowering of ionic strength (micron) from 0.1 to 0, fulvic acid metal ratios tended to fall below 1.0, indicating the formation of mixed or polynuclear complexes, the extent of which was related to the ability of the metal of form either strong or weak complexes with fulvic acid. At ionic strength =0.1, however, all complexes were mononuclear with respect to the metals. Between pH 3 and 5 and at $u=0.1$, fulvic acid formed 1:1 molar same ionic strength value, but at pH 1.7 and 2.35, 1: 1 complexes were formed with Fe^{3+} and Al^{3+}. Stability constants from the 2 methods showed good agreement and increased with increasing pH. The order of stabilities at low pH was Fe^{2+} greater than Al^{3+} greater than Cu^{2+} greater than Ni^{2+} greater than Co^{2+} greater than $Pb^{2+} = Ca^{2+}$ greater than Zn^{2+} greater than Mn^{2+} greater than Mg^{2+}. Probably, stability constants measured at low ionic strength are more relevant to soils than those determined at higher ionic strength.

639
Reactions of Humic Substances with Metal Ions and Hydrous Oxides

Schnitzer, M.; Khan, S.U.

Marcel Dekker, Inc., New York, 1972. p. 203-251; 1972

HUMIC; METAL IONS; HYDROXIDES

640
OrganoMetallic Interactions in Soils. 7. Stability Constants of Pb(2 plus), Ni (2 plus), Co(2 plus), Ca(2 plus), and Mg(2 plus) - Fulvic Acid Complexes

Schnitzer, M.; Skinner, S.I.M.

Soil Science, 103(4), 247-252; 1967

SOILS; FULVIC ACID; ORGANOMETALLICS; LEAD; NICKEL; MANGANESE; MAGNESIUM; COBALT; CALCIUM

641
Organo-metallic Interactions in Soils: 5. Stability Constants of Cu^{++}-, Fe^{++}-, and Zn^{++}-Fulvic Acid Complexes

Schnitzer, M.; Skinner, S.I.M.

Soil Sci., 102, 361-365; 1966

COPPER; IRON; ZINC; FULVIC ACID; PH; ION EXCHANGE

The ion-exchange equilibrium method of Schubert was used to determine stability constants K. Log K values at pH 3.5 and 5.0 were respectively 5.78 and 8.69 for Cu-fulvic acid complexes, 5.06 and 5.77 for Fe-fulvic acid complexes and 1.73 and 2.34 for Zn-fulvic acid complexes.

642
Organo-Metallic Interactions in Soils: 1. Reactions between a Number of Metal Ions and the Organic Matter of a Podzol B(h) Horizon

Schnitzer, M.; Skinner, S.I.M.

Soil Sci., 96, 86-93; 1965

ORGANOMETALLICS; SOILS; METALS; ORGANIC MATTER; PODZOL SOILS

643
Organo-Metallic Interactions in Soils. 4. Carboxyl and Hydroxyl Groups in Organic Matter and Metal Retention

Schnitzer, M.; Skinner, S.I.M.

Soil Sci., 99, 278-284; 1965

ORGANOMETALLICS; METALS; SOILS; CARBOXYL; HYDROXYL GROUP; ORGANIC MATTER; RETENTION

644

Chemical and Biochemical Aspects of Leachate

Schoenberger, R.J.; Fungaroli, A.A.; Drexel Inst. Technol.

Part of Proceedings of National Industrial Solid Wastes Management Conference, University of Houston, Houston, TX (p. 307-310); 1972

LEACHATE; SANITARY LANDFILLS; DEGRADATION; BOD; COD; METALS; ANALYSIS; ADSORPTION

In determining the biochemical aspects of leachate from sanitary landfills, it is necessary to analyze the degradation product components which are produced. Neither the classical BOD test nor the chemical oxygen demand test is adequate to describe the composition and the potential degradation of the organic fraction. From the standpoint of interferences, the COD is more reliable and not subject to microbial inaccuracy from the heavy metals. Many of the more sophisticated methods of analysis have not been proposed, although it will be necessary to develop data using these analytical tools if treatment of the leachate is contemplated. Some of these tools are the volatile acids determination and the use of total carbon or total organic carbon analyzers. The use of total carbon appears to be feasible if the leachate solution is relatively clean and not burdened with suspended solids. For leachate, this is not the case and preconditioning is necessary. The removal of these suspended solids is an analytical interference since the suspended solids adsorb some of the degradation products. The magnitude of the contribution of these products has not been determined. Preliminary work using volatile acid data shows that the number of acids is large and cannot be easily separated. There does not appear to be a direct relationship between COD and BOD determinations. In general, the COD appears to be about 4-5 times greater than the BOD determination for the samples analyzed. Certainly this cannot be construed to be a general relationship, since many other variables would have to be studied.

645

Determination of the Purifying Capacity of Soils with Respect to Heavy Metal Ions (Zinc, Copper, and Lead)

Schoettler, U.; Tech. Hochsch., Aachen, Germany

Geol. Mitt. (GEMTA9) 1972, 12(1), 61-76; 1972

SOILS; METALS; REMOVAL; ZINC; COPPER; LEAD

646

Soil Analyses in the Smoke Damaged Area of the Metallurgical Plant Oker in Unterharz (Ueber bodenkundliche Aufnahmen im Rauchschadengebiet der Unterharzer Huettenwerke Oker)

Schucht, F.; Baetge, H.H.; Dueker, H.

Landwirt. Jahrb., 76, 51-98; 1932

METALLURGICAL PLANTS; SULFUR DIOXIDE; NITROUS ACID; CARBON DIOXIDE; EMISSIONS; ROOT CROPS; COPPER; LEAD; ZINC; ARSENIC; SOILS; NITROGEN; CROPS; ROOTS; SMOKE

The metallurgical plants in Oker primarily emit sulfur dioxide, nitrous acid, and carbon dioxide. The effect of these emissions on the soil was determined by taking soil samples, profile samples, and individual samples at 42 points. The area has primarily clay soil interspersed with sand and gravel. The soil was studied to determine the absorption, permeability, and coherence. Hydrochloric acid extracts were analyzed to determine if changes had occurred because of the pollutants. With prevailing west winds, an extensive area receives the emissions from the metallurgical plants. In all samples, an enrichment of the sulfates (in the form of calcium sulfate) was found. This cannot cause soil damage since the quantities are too small. With the influence of sulfur dioxide and carbon dioxide, the soil loses its alkalinity. However, the soil contained so much calcium the sulfur dioxide became bound. Iron sulfates, which form only without alkalinity, could not be determined. Within a belt of one to one and one half kilometer wide, hardly anything grew. This belt was followed by a zone (2 kilometer from the emission source) where the root crops were still heavily damaged. Between three and three and one half kilometers from the emission source, the effect of the pollutants was weak. Also the metals copper, lead, zinc, and arsenic were found in the soil; they are mostly insoluble, and thus are harmless compounds.

647

Hazardous Wastes - Water Pollution Control Survey

Schwer, M.

Surveyor, 142(4233), 29-46; 1973, July 27

CHROMIUM; CYANIDE; EFFLUENTS; HAZARDOUS CHEMICALS; INDUSTRIAL WASTE; LANDFILLS; OILS; PLATING; METAL FINISHING: REGIONAL PLANNING; REVIEW; RIVER AUTHORITIES; TREATMENT METHODS; TREATMENT PLANT; WASTE DISPOSAL; LIQUID WASTES: TIPPING

The value of centralize d treatment plant for the treatment of liquid hazardous wastes, as opposed to tipping is stressed, and the facilities available are outlined. Some notification statistics under the D.P.W. act are presented.

648
Behavior of Synthetic Detergents in Soil: III. Soft Detergents, Microorganisms and Soil

Sebastiani, L.A.; Simonetti, A.D.; Borgioli, A.; Ist. Ig., G. Sanarelli, Univ. Roma, Roma, Italy

Nuovi Ann. Ig. Microbiol., 22(4), 229-242; 1971

DETERGENTS; SOILS; MICROORGANISMS; DBS; DODECYL BENZENE SULFONATE; DEGRADATION; PERCOLATION

The biodegradable DBS (dodecylbenzene sulfonate. 18 mg 1) percolating through a bioactive sand column and the extent to which this detergent affects the usual STAPHYLOCOCCUS displacement through the column were studied. The displacement of a biodegradable detergent through soil appears similar to that of a non-degradable detergent: there is an almost ccmplete recovery from the points nearest to the head and a recovery of about 80 degrees, from the most distal point. After about 9-101 of percolating liquid, DBS concentration begins to show a precise concentration till, at about 18-20 of liquid it reaches extremely low values. DBS undergoes degradation by the STAPHYLOCOCCUS present in the column. Especially in comparisons of the drawing points most distant from the head, where degradation is more accentuated, the amount of STAPHYLOCOCCI transported by DBS solution is lower than the corresponding amount transported by water. This result is different from that obtained by means of percolation through a similar column of a non-degradable DBS solution; the microorganisms transported by the detergent solution continually remained higher than that transported by water alone.

649
Toxicity and Movement and Heavy Metals in Serpentinic Soils Northeastern Portugal

Sequeira, E.M.D.

Agron. Lusitana, 30(2), 115-154; 1968

NICKEL; WEATHERING; EROSION; METALS; MOVEMENT; SOILS; SERPENTINE SOILS

650
Molybdenum in Soil

Sequi, P.; Laboratorio per la Chimica del Terreno del C.N.R., Pisa, Italy

Agrochimica (1972) 17(1-2) 119-140

MOLYBDENUM; SOILS; REVIEW

651
Transport of Lead in the Environment

Servant, J.

Part of Proc., Int. Simp., Environ. Health Aspects Lead(26YVAJ) 1973, (155-65); 1973

LEAD; TRANSPORT; RAINWATER; LAKE WATER; SOILS

652
The Carcinogenic Hydrocarbon Benzo(A)Pyrene in the Soil

Shabad, L.M.; Cohan, Y.L.; Ilnitsky, A.P.; Khesina, A.Y.; Shcherbak, N.P.; Smirnov, G.A.

J. Natl. Cancer Inst., 47(6), 1179-1191; 1971

MOUSE; SOILS; BACTERIA; PLANTS; CARCINOGENS; SKIN CANCER; MICE; HYDROCARBONS; BENZO(A)PYRENE

653
Level of Benzo(A)pyrene in Soils and Vegetation After Nerozin Application

Shabad, L.M.; Kogan, Y.L.

Onkologiya (Kiev) (KLGAR), 3, 105-107; 1972

BENZOPYRENE; PLANTS; SOILS; NEROZIN; VEGETATION; BENZO(A)PYRENE

654
Circulation of Carcinogenic Hydrocarbons in the Environment and Their Metabolism in Cells

Shabad, L.M.; Vasil'ev, Y.M.

Puti Razv. Sovrem. Onkol. (24BQAB), 47-53; 1970

REVIEW; CARCINOGENS; HYDROCARBONS; SOIL; METABCLISM; MAMMALIAN CELLS; SOILS BACTERIA

A review discussing the movement of carcinogenic hydrocarbons through the human environment and the metabolism of these compounds by soil bacteria and mammalian cells.

655
Retention of Copper by Bundelkhand Soils

Shanker, H.; Dwivedi, K.N.; Uttar Pradesh Inst. Agric. Sci., Kanpur, India

Indian J. Agr. Res.(IJARC2) 1972, 6(1) 19-22; 1972

COPPER; RETENTION; SOILS; SORPTION; PH

656
Contents of Mobile Forms of Copper, Zinc, Manganese, Cobalt, Molybdenum, and Boron Certain Types of Peaty Soils in Polders in the Kaliningrad Region

Shirokov, V.V.

Zap Leningr S-Kh Inst 134 1969 Trans 52-57.

COPPER; ZINC; MANGANESE; COBALT; MOLYBDENUM; BORON; PEATY SOILS; MOBILITY; AMELIORATION; CULTIVATION; SOILS

657

Effect of Different Sources of Organic Matter on the Recovery of Added Water Soluble Zinc in Solids

Shukla, U.C.; Anand, S.S.; Randhawa, N.S.; Dep. Soils, Haryana Agric. Univ., Hissar, India

Haryana Agr. Univ. J. Res.(HAJRA5) 1971, 1(3) 8-13; 1971

ZINC; SOILS; ORGANIC MATTER

658

Zinc Absorption by Corn Hybrids from Solutions, Clay Suspensions and Soils

Shuman, L.M.; Pennsylvania State Univ., Dept. of Agronomy University Park, PA

Pennsylvania State Univ., University Park, Dept. of Agronomy (TID--25768); 1970, June

ZINC; ABSORPTION; CORN; HYBRIDS; CLAY SUSPENSIONS; SOILS; CLAY

659

Soils Capacity for Accepting Organic Fertilizers

Siegel, O.

Bodenkultur., 24(3), 237-252; 1973

METALS; WASTES; ORGANIC FERTILIZERS; FOODS; SOILS

660

On the Effect of Some Soil Factors on the Solubility of Trace Elements

Sillanpaa, M.

Agrogeol. Julk., 81, 24; 1962

TRACE ELEMENTS; SOILS; PH; MANGANESE; ZINC; NICKEL; COPPER; LEAD; COBALT

Total contents of trace elements decreased in the order Mn greater than Zn greater than Ni greater than Cu greater than Pb greater Co and were generally greater in fine mineral soils than in coarse soils and especially in organic soils. The contents of soluble trace elements generally increased with their total amounts and with decreasing pH, particle size and C/N ratio, and increasing organic-matter levels of the soils.

661

Trace Elements in Finnish Soils as Related to Soil Texture and Organic Matter Content

Sillanpaa, M.

Maataloust. Aikak., 34, 34-40; 1962

TRACE ELEMENTS; SOILS; ORGANIC MATTER

662

Stability Constants of Metal-Ion Complexes

Sillen, L.G.; Martell, A.E.

2nd ed., Special Publication No. 17. The Chemical Society, London (p. 754); 1964

COMPLEXES; STABILITY CONSTANTS; ION COMPLEXES; METALS

663

The Injurious Effect of Mercury Vapor From Bichloride of Mercury in Soil of Rose Houses

Simmerman. P.W.; Crocker, W.

Boyce Thompson Inst., Prof.Paper, 1(23), 222-225; 1933

BICHLORIDE; ORGANIC MATTER; MERCURY; AIR; BUDS; TANKAGE; RATE; REDUCTION; VAPOR; ROSES; MERCURY BICHLORIDE

The organic matter of the soil reduces the bichloride to metallic mercury and the vapours of the mercury rise into the air and kill the buds: when the soil is rich in tankage or other organic matter, the rate of reduction of the bichloride is increased, and consequently the severity of the injury.

664

Retention of Added Copper by Two Soils as Affected by Organic Matter, $CaCO_3$ and Exchangeable Ions

Singh, M.; Haryana Agric. Univ., Hissar, India

Geoderma 5, 219-227; 197

RETENTION; ORGANIC MATTER; COPPER; SOILS; ION EXCHANGE; LOAM; CALCIUM CARBONATE; SAND; HUMIC ACIDS

Untreated samples of a loam and a loamy sand soil and samples from which organic matter and $CaCO_3$ had been extracted with H_2O_2 and HCl, respectively, and replaced by 0, 1, 2, 3 or 4% humic acid and 0, 2, 4, 6 or 8% $CaCO_3$, respectively, were equilibrated with $CuSO_4$ solution. Samples treated with with H_2O_2, HCl, H_2O_2 + HCl, HCl + $CaCl_2$ and HCl + NaCl were also equilibrated with $CuSO_4$ solution. Soil with added humic acid retained more Cu than soil with all the organic matter removed and the amount retained increased with increasing humic acid content. Added humic acid, however, retained less and fixed a smaller proportion of added Cu than samples with their original organic matter undisturbed. Added $CaCo_3$ also increased Cu retention but to a smaller extent than humic acid. HCl treatment of soils reduced Cu retention considerably but Ca and Na saturation of H-saturated soils increased Cu retention but not to the level of untreated soils. The loam soil retained more Cu than did the loamy sand.

665
Profile Distribution of Trace Elements in some Typical Soils of Aligarh District

Singh, R.; Singhal, J.P.; Fac. Eng. Technol., Aligarh Muslim Univ., Aligarh, India

Indian J. Appl. Chem.(IJACAN) 1970, 33(6) 351-6; 1970

TRACE ELEMENTS; SOILS; CATION EXCHANGE MICRONUTRIENTS; CALCIUM CARBONATE; BORON; COBALT; COPPER

666
Forms of Copper in the Soils of Narsinghpur District of Madhya Pradesh

Singh, S.; Jain, R.K.; Banaras Hindu University, Varanasi, India

Indian Journal of Agricultural Research, 5(4), 271-274; 1971

ORGANIC MATTER; AVAILABILITY; PH; CALCIUM CARBONATE; COPPER; SOILS

Fifteen samples of soils ranging from black to brown were studied. Total Cu ranged from 6.0 to 178.8 (average 76.1) ppm and available Cu from 0.12 to 1.56 (0.77) ppm. Total Cu was correlated with CaCO3 and organic matter contents (r = 0.3900 and 0.3981 respectively) and available Cu with soil pH and CaCO3 content (r = 0.3701 and 0.4604 respectively).

667
Organo-Metallic Phosphates. I. Interaction of Phosphorus Compounds with Humic Substances. II. Physico-Chemical Characteristics of Humic and Fulvic Metal Phosphates

Sinha, M.K.; Timiryazev Academy of Agricultural Sciences, Moscow, USSR

Plant and Soil 35(3), 471-484, 485-493; 1971

PHOSPHORUS; SOLUBILITY; MOBILITY; ORGANOMETALLIC PHOSPHATE; HUMIC ACIDS; FULVIC ACID; IRON COMPLEXES; ALUMINUM COMPLEXES; AVAILABILITY; PLANTS; ORGANOPHOSPHATES; ORGANOMETALLICS

In laboratory studies, under simulated natural conditions, stable undissociable organo-metallic phosphates were found only when humic and fulvic acids contained complexed iron or aluminum and they possessed varying degrees of solubility and mobility. Because of their higher mobility, fulvic acid-metal phosphate compounds should be relatively more available to plants than the humic acid compounds. Between 20 and 30% of the P in the two classes of compound was isotopically exchangeable.

668
Residues of Atrazine, Cyanazine, and their Phytotoxic Metabolites in a Clay Loam Soil

Sirons, G.J.; Frank, R.; Sawyer, T.; Prov. Pestic. Residue Test. Lab., Ontario Minist. Agric. Food, Guelph, Ontario, Canada

J. Agr. Food Chem.(JAFCAU) 1973, 21(6) 1016-20; 1973

ATRAZINE; METABOLITE; SOILS; CYANAZINE; METABOLISM; CLAY LOAM; LOAM; TRANSFORMATION; DEETHYLATION; DEISOPROPYLATION; CYANAZINE AMIDE; RESIDUES; DEGRADATION

In clay loam soil, atrazine was converted to 2-chloro-4-amino-6-isopropylamino-s-triazine (deethylated atrazine) as major and to 2-chloro-4-amino-6-ethylamino-s-triazine (deisopropylated atrazine) as minor phytotoxic metabolites, and cyanazine was converted to the deisopropylated atrazine as the major phytotoxic metabolite. Cyanazine amide was also found. The concentration of deethylated atrazine reached peak concentrations in the soil 5-6 months after application of atrazine, whereas peak concentrations of deisopropylated atrazine were reached 2-3 months after atrazine or cyanazine application.

669
The Content of Mobile Zinc in Soils Along the Danube and Raba Rivers

Six, L.

Mosonmagy. agrartud. Foisk. Kozl., 10, 39-43; 1967

RIVERS; ZINC; SOILS; HUMOSE; PEAT

Mobile Zn (determined colorimetrically in N-KCl extracts) in the top layer of seven profiles varied from 0.03 microgram/g in peat to 0.08-0.28 microgram/g in slightly humose alluvial soils; Zn contents tended to decreased with depth.

670
Correlation Between the Taxonomic Position of Soil Mycobacteria and Their Ability to Transform Aromatic Hydrocarbons

Skryabin, G.K.; Golovlev, E.L.; Golovleva, L.A.; Institut Biokhimii i Fiziologii Mikroorganismov Akademii Nauk SSSR, Pushchino-na-Oke

Doklady Akademii Nauk SSSR 200, 1224-1226; 1971

MYCOBACTERIA; AROMATIC HYDROCARBONS; DIMETHYLBENZENES; DECOMPOSITION; HEXADECANE; AROMATIC OXYACIDS; DICARBOXYLIC ACIDS; MONOCARBOXYLIC AROMATIC ACIDS; TRANSFORMATION; SOILS; MICROORGANISMS

Of 75 species of NOCARDIA and MYCOBACTERIUM, 80% decomposed dimethylbenzenes in a liquid mineral medium containing hexadecane as C source. Decomposition did not occur in the absence of hexadecane, in media containing glucose, in meatpeptone broth or in liquid wort. There were 3 groups of dimethylbenzene-decomposing bacteria. MYCOBACTERIUM MUCOSUM, M. PERRUGOSUM, NOCARDIA GLOBERULA, N. OPACA, N. ERYTHROPOLIS and PROACTINOMYCES GLOBERULUS produced aromatic oxyacids. Two strains of NOCARDIA produced dicarboxylic acids. MYCOBACTERIUM RUBRUM, NOCARDIA RUBRA, N. CORALLINA, and N. RUBROPERTINCTA sp.n. produced monocarboxylic aromatic acids.

671
Use and Residues of Mercury Compounds in Agriculture

Smart, N.A.

Residue Rev., 23, 1-36; 1968

RESIDUES; MERCURY; AGRICULTURE; REVIEW; CROPS; SOILS

A review of use of mercury compounds agriculture, including mercury residues in soil and crops. (109 references)

672
The Study of the Benz-Alpha-Pyrene Content in the Soil and Vegetation in the Airfield Region

Smirnov, G.A.

Vop. Onkol. 16(5), 83-86; 1970

CARCINOGENS; SOILS; BENZO(A)PYRENE; VEGETATION; PLANTS

673
Changes in the Zinc Distribution Within Three Soils and Zinc Uptake by Field Beans Caused by Decomposing Organic Matter

Smith, R.J.; Shoukry, K.S.M.

Part of Isotopes and Radiation in Soil Organic Matter Studies Proc. Sym. IAEA & FAO, Vienna, July 1968 (p. 397-410); 1969

ZINC; SOILS; UPTAKE; BEANS; PLANTS; DECOMPOSITION; ORGANIC MATTER; DISTRIBUTION

674
Specific Gravity of Fiber Length of Loblolly Pine-G and Spruce Pine-G on the Same Site

Snyder, E.B.; Hamaker, J.M.

U.S. Forest Service Research Note SO, 103, 1-3; 1970

SPECIFIC GRAVITY; FIBER LENGTH; LOBLOLLY; PINE-G; SPRUCE PINE-G; PINE; SPRUCE

675
Transport, Distribution, and Degradation of Chlorinated Hydrocarbon Residues in Aquatic Model Ecosystems

Soedergren, A.; Dep. Anim. Coll., Univ. Lund, Lund, Swed.

Oikos(OIKSAA) 1973, 24(1) 30-41; 1973

INSECTICIDES; DEGRADATION; TRANSPORT; AQUATIC ECOSYSTEMS; CHLOPHEN; DDT; DDE; MODEL ECOSYSTEM

676
Lead Contamination of Plants and Soils Caused by Automobile Exhaust Gases

Sommer, G.; Rosopulo, A.; Klee, J.

Z. Pflanzenernaehr Bodenkd., 130(3) 193-205; 1971

GRASSES; WHEAT; MAIZE; POTATOES; TRAFFIC AUTOMOBILE EMISSIONS; LEAD; PLANTS; SOILS

677
The Uptake of Radioactivity Directly Through Leaves and Indirectly Via the Roots of Plants

Sommermeyer, K.; Godt, K.J.; University of Freiburg, Institute of Radiology, Freiburg, Germany

Part of Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, Held in Geneva, Switzerland, September 1-13, 1958, Vol. 18, Waste Treatment and Environmental Aspects of Atomic Energy, (p. 500-502); 1958

PLANT UPTAKE; SOILS; FOLIAR ADSORPTION; STRONTIUM 90; ZINC 65; NIOBIUM 95; CESIUM 137; ZIRCONIUM 95

The contamination of plant tissue with radioactive fission products was determined to be largely through wet fallout. Plant at high altitude subject to greater wet fallout contained larger concentration of radioactivity.

678
Behavior of Heavy Metals in Soil-Crop System. 1. Distribution of Cadmium in Soils and Its Retention by Soil

Sonoda, Y.; Maeda, T.; Iwai, I.; Gifu Univ., Kagamigahara, Japan

Gifu Daigaku Nogakubu Kenkyu Hokoku (GNKEAH) 33, 113-120; 1972

SOILS; CADMIUM; SORPTION; ZINC; HEAVY METALS; CROPS

679
Behavior of Heavy Metals in Soil-Crop System. 2. Status of Copper on Each Horizons in Kakamigahara Soil

Sonoda, Y.; Oguri, M.; Iwai, I.; Gifu Univ., Kagamigahara, Japan

Gifu Daigaku Nogakubu Kenkyu Hokoku(GNKEAH) 1972, No. 33, 121-128; 1972

COPPER; SOILS; ORGANIC MATTER; HEAVY METALS; CROPS

680
Problem Definition Study: Evaluation of Health and Hygiene Aspects of Land Disposal of Wastewater at Military Installations

Sorber, C.A.; Schaub, S.A.; Guter, K.J.; Army Medical Environmental Engineering Research Unit, Edgewood Arsenal, MD

Report No. USAMEERU-73-02; Task 3-A-062110-A-80600; Monitoring Agency Rept. No. 18; Proj. DA-3-A-062110-A-806; AD-752 122; 40 p.; 1972, August

SPRAYS; AIR; PESTICIDES; NITROGEN; BACTERIA; AEROSOLS; SEWAGE IRRIGATION; SEWAGE DISPOSAL; LIQUID WASTE DISPOSAL; SEWAGE; IRRIGATION; SANITARY ENGINEERING; WATER

The United States Army is presently using and is planning to expand its use of various modes of land disposal of treated sewage at installations within the United States. The report reviews the considerations involved in using sewage for irrigation purposes. Discussed are physical, biological, and chemical environmental factors.

681
Water, Air, Soil. Pollution in Finland

Soveri, J.; Acqua, Aria, Suolo, Inquinamento in Finland

Ecologia, 3(10), 28-33; 1973

WATER; AIR; SOIL; MERCURY; POWER PLANTS; INDUSTRY

A study on the interdependent relationships among soil, air and water pollution and the amounts and distribution of industrial pollution in Finland is presented. Special attention is given to mercury contamination of soil and water areas, and tables and demographic maps are provided to better illustrate the extent of this problem. The role of power plants in the production of environmental pollution is also considered in this report.

682
Degradation of Methyl Mercury by Bacteria Isolated from Environmental Samples

Spangler, W.J.; Spigarelli, J.L.; Rose, J.M.; Flippin, R.S.; Miller, H.H.

Appl. Microbiol., 25 (4), 1973, 488-493

DEGRADATION; MERCURY; METHYLMERCURY; BACTERIA

683
Studies on Sorption and Migration of Radioactive Elements in Soils

Spitsyn, V.; Balukova, V.C.; Ermanova, T.A.

Part of Proceedings International Atomic Energy Agency, Treatment and Storage of High-Level Radioactive Wastes. Vienna October 8-12, 1962. (569-577) 666; 1963

SOILS; SORPTION; MIGRATION; RADICISOTOPES; RADIOACTIVE ELEMENTS; SAND; STRONTIUM; CESIUM; DIFFUSION; MOVEMENT

The paper presents the results of investigations into the sorption and migration of radioelements during radioactive filtering flow through the soil. For this purpose the authors used the types of sand, of average coarseness and effective porosity, which are to be found vidley disseminated throughout the central belt of the Soviet Union. It is shown that the sorption of strontium and cesium take place separately and that the capture of cesium by soils is an irreversible process. It is also shown that sorption processes inhibit the filter-diffusion process at low diffusion rates and that the strontium movement is 40-60 times slower than the filtering and the cesium movement 100 times slower. Trials were made with a method of calculating the basic kinetic parameters of sorption, thus making it possible to characteristize the movement of radioactive strontium and describe the migration of radioactive cesium.

684
A Study of the Migration of Radioelements in Soils

Spitsyn, V.; Malukova, V.D.; Naumova, A.F.; Gromov, V.V.; Spiridenov, F.M.; Vetrov, E.M.; Groffo, G.I.

Part of Second U.N. International Conference on Peaceful Uses of Atomic Energy, 18, Sept. 1-13, 1958, Geneva, Switzerland; 1958

MIGRATION; SOILS; RADIOISOTOPES; TRANSPORT; RADIOELEMENTS

685
Studies of Trace Elements in Soils and Plants from the Four Corners Area of New Mexico

Stark, N.B.; Harris, P.F.; Nevada Univ., Reno. Center for Water Resources Research

Project Rept. No. 20 April 16-June 30, 1972; Contract EPA-68-02-0269; Monitoring Agency Rept. No. EPA-R4-72-007; F; 96; 1972, September

SOILS; ANALYSIS; PLANTS; SAMPLING; ARSENIC; BERYLLIUM; CADMIUM; CHROMIUM; FLUORIDES; LEAD; MANGANESE; MERCURY; MOLYBDENUM; NICKEL; SELENIUM; AIR; ELECTRIC POWER PLANTS; FLY ASH; ANIMALS; COAL-FIRED POWER PLANTS

A study was initiated as a result of the need to develop background and preliminary data on the environmental effects of coal-fired power plants. The objective of the study was to measure the concentration of eleven trace elements in plants and soils in the Four Corners Area of New Mexico. Selection of the elements was made on the basis of data obtained from a survey on the chemical make-up of the fly ash emitted by the power plants in this location. These eleven elements are: As, Be, Cd, Cr, F, Pb, Mn, Hg, Mo, Ni, Se. Some of the elements studied, such as mercury, lead and selenium, are known to be toxic to animals in relatively low concentrations. This study, by sampling plants and soils in two different locations, attempted to develop preliminary data on the potential buildup of each trace element.

686

Arsenic Residues in Soil and Potatoes from Wisconsin Potato Fields-1970

Steevens, D.R.; Walsh, L.M.; Keeney, D.R.; Dep. Soil Sci., Univ. Wisconsin, Madison, Wis.

Pestic. Monit. J.(PEMJAA) 1972, 6(2), 89-90; 1972

ARSENIC; RESIDUES; POTATOES; SOILS

687

Arsenic Phytotoxicity on a Plainfield Sand as Affected by Ferric Sulfate or Aluminum Sulfate

Steevens, D.R.; Walsh, L.M.; Keeney, D.R.; University of Wisconsin, Madison, Wisc 53706

Journal of Environmental Quality, 1(3), 292-295; 1972

ARSENIC; SODIUM ARSENITE; PESTICIDES; DESICCANTS; DEFOLIANTS; PEAS; POTATOES; POTATO PEELINGS; CROP YIELDS; PERSISTENCE; UPTAKE; SOILS; PHYTOTOXICITY; LEACHING; ALUMINUM SULFATE; FERRIC SULFATE; TOBACCO; COTTON; CROPS; SAND; MOVEMENT

Repeated use of arsenic (As) salts in orchards, cotton, and tobacco fields occasionally has caused phytotoxicity. A study was initiated to evaluate the effect of periodic applications of sodium arsenite ($NaAsO_2$) which has been used extensively as a defoliant to kill potato vines in Wisconsin commercial potato fields. Sodium arsenite was applied in 1967 to a Plainfield sand at rates varying from 45 to 720 kg As/ha. In 1970, these field plots were subdivided and treated with ferric sulfate ($Fe_2(SO_4)_3$) and aluminum sulfate ($Al_2(SO_4)_3$) to attenuate As toxicity, planted to peas (PISUM SATIVUM L.) and potatoes (SOLANUM TUBEROSUM L.) and yields compared with those obtained in earlier investigations. Arsenic toxicity persisted over a period of four cropping seasons. Pea yields on As-treated soil tended to be higher with an application of $Fe_2(SO_4)_3$ and lower with an application of $Al_2(SO_4)_3$, although yields generally were not significantly changed by either material. Potato yields were not affected by application of $Fe_2(SO_4)_3$, therefore, neither $Fe_2(SO_4)_3$ or $Al_2(SO_4)_3$ were effective at the rate used in reducing toxicity. Potato tuber peelings contained up to 53.7 ppm of As, but regardless of treatment, the tuber flesh did not exceed 1 ppm. Ferric sulfate or $Al_2(SO_4)_3$ did not have a consistent effect on the concentration of As in potato peelings or tuber flesh. The As content of As-treated soil increased in the subsoil but decreased in the plow layer during four cropping seasons. The increase in subsoil As was found to a depth of 38 cm and 68 cm for treatments of 90 and 180 kg As/ha and 720 kg As/ha, respectively. Even considering the downward movement, all of the As applied in 1967 as $NaAsO_2$ was not accounted for in the soil profile (0-83 cm).

688

Sorption of Trace Quantities of Metal Ions by Bentonite Clay from a Thiosalt Medium

Steger, H.F.

Canadian Mining and Metallurgical Bulletin, 67(744), 90-95; 1974, April

SORPTION; CLAY; BENTONITE CLAY; IRON; COPPER; ZINC; LEAD; SODIUM; CALCIUM; WASTEWATER; MINES; PH; MANGANESE; WATER; METAL IONS; LIMING

The sorption by bentonite clay of trace amounts of iron, copper, zinc, and lead, in the presence of 100-fold (or greater excesses of sodium and calcium, from a synthetic (sulphide) mine waste water has been studied. The amounts sorbed were found to depend on the nature and concentration of the metal ion, the number and total concentration of the metal ions present, the pH of the medium, the amount of clay used and the contact time of the clay with the medium. The bentonite clay has been tested with a sample of real "lime-treated" mine waste water and found to reduce appreciably the concentration of iron, copper and zinc, but to have no significant effect on that of manganese.

689

Organic Matter Reaction Involving Micronutrients in Soils

Stevenson, F.J.; Ardakani, M.S.

Part of J.J. Mortvedt, P.M. Giordano, and W.L. Lindsay (Eds.), Micronutrients in Agriculture. Soil Science Society of America. Madison, Wisconsin (79-114); 1972

ORGANIC MATTER; MICRONUTRIENTS; SOILS; TRACE ELEMENTS

690

Edaphic Aspects of the Disposal of Unused Pesticides, Pesticide Wastes, and Pesticide Containers

Stojanovic, B.J.; Kennedy, M.V.; Shuman, F.L.; Mississippi State Univ., State College, Miss.

J. Environ. Qual.(JEVQAA) 1972, 1(1), 54-62; 1972

PESTICIDES; BIODEGRADATION; SOILS; BACTERIA; DISPOSAL; LOAM; CALCAREOUS LOAM; MICROFLORA; PARAQUAT; DIELDRIN; PICLORAM; VERNOLATE; BROMINE; ZINC; ARSENIC

Complete biodegradation of all pesticides does not occur in the soil. The biodegradation and the effects in the soil microflora of 20 analytical grade and formulated pesticides, and 7 formulations mixtures were studied in a calcareous loam. The soil was amended with 11,227 kg/ha of the respective active ingredient (S), and was subsequently incubated for 56 days. The extent of biodegradation was estimated from the CO_2 evolved during the incubation, and the effects on the microbial populations were determined. From plate counts of the incubated samples. Picloram, paraquat, Vernolate, and Dieldrin, as well as 8 of the formulations, were partly degraded. Single pesticides inhibited bacterial growth, but affected streptomyces and fungi much less drastically. Mixtures of formulations were more biodegradable than the single pesticides, provided that at least 1 or 2 pesticides in the mixture. Were relatively rapidly biodegraded. The mixtures reduced the number of bacteria, but favored growth of streptomyces and fungi. Incineration of liquid formulations at 900 degrees produced little ash. The incineration of solids, however, yielded substantial amounts of incombustible residues. Analysis of the ash from the solid indicated in several cases the presence of toxic elements, such as Br, As, Zn, etc.

691
The Fate of Chromium During the Treatment of Sewage

Stones, T.

Inst. Sew. Purifi., Lond. Journ. and Proc., 345-347; 1955

FATE; CHROMIUM; SEWAGE

692
The Fate of Zinc During the Treatment of Sewage

Stones, T.

Inst. Sew. Purif., Lond Jurn. and Proc., 254-257; 1959

FATE; ZINC; SEWAGE

693
The Fate of Copper During Treatment of Sewage

Stones, T.

Inst. Sew. Purifi., London, Journ. and Proc. 82-84; 1958

FATE; COPPER; SEWAGE

694
The Fate of Lead During the Treatment of Sewage

Stones, T.

Inst. Sew. Purif., London. Journal and Proc., 221-223; 1960

FATE; LEAD; SEWAGE

695
Investigation of Mercury Pollutant Interaction with Humic Acids by Means of Radio Tracers

Storhal, P.; Huljev, D.

Part of Welsh, C.N. (Ed.). International Atomic Energy Agency Proceedings Series. Nuclear Techniques in Environmental Pollution. Symposium, Unipub, Inc.; New York, N.Y. U.S.A. 1971, (p. 439-446), 810

SEA WATER; SEDIMENTS; SEA WATER; MERCURY; HUMIC ACIDS; RADIO TRACER; WATER

696
Adsorption of Arsenites by a Few Typical Indian Soils

Sundd, D.K.; Bansal, O.P.

Indian J. Appl. Chem., 29, 23-26; 1966

SOILS; ADSORPTION; ARSENITE; BLACK SOILS; CLAY LOAM; LATERITE; SESQUIOXIDES; CLAY; LOAM; CALCIUM; MAGNESIUM; SANDY LOAM

In black soil from Bhopal, clay loam and sandy loam from Delhi, and a laterite, arsenite adsorption was influenced by the amount of sesquioxides present, the clay content, and the amount of exchangeable Ca^{++} and Mg^{++}.

697
Migration of Mercury During Supergene Processes

Surgai, V.T.; Kurmanaliev, K.K.; Turdukeev, I.D.; Shatemirov, S.K.; Chubar, Y.A.

Zap. Kirg. Otd. Vses. Mineral. Obshchest. (ZKMOA7), 8, 6-10; 1972

MERCURY; TRANSPORT; SALTS; CINNABAR; MIGRATION

698
Distribution of Heavy Metals in Serpentine Soil

Suzuki, S.; Mizuno, N.; Kimura, K.; Government Industrial Development Laboratory, Hokkaido, Japan

Soil Science and Plant Nutrition, 17(5), 195-198; 1971

DISTRIBUTION; SAND; CLAY; CHROMIUM; NICKEL; MANGANESE; METALS; TRACE ELEMENTS; SOILS; SERPENTINE

The total and soluble heavy metal contents of a serpentine soil were determined and the fine sand fraction was subjected to an electron probe analysis. Chromium, whose solubility was very low compared to nickel, was concentrated with manganese in the ferromagnetic and heavy nonmagnetic minerals but its concentration in the clay fraction was low. Conversely Ni occurred mainly in the clay fraction.

699
Trace-Element Distribution in Soil Profiles

Swaine, D.J.; Mitchell, R.L.

J. Soil Sci., 11, 347-368; 1960

TRACE ELEMENTS; SOILS; DISTRIBUTION

700
Adsorbent for Treating Industrial Waste Waters and Removing Agrochemicals from Soils

Takakura, H.

Japan. Kokai, 73 39380 (13(9)B5, 13(9)F2, 91 C91), 4 p.; 1971, September

ADSORBENTS; WASTE WATER; CADMIUM; REMOVAL; WATER; SOILS; WASTE

701
Cadium Contamination of Soils and Rice Plants Caused by Zinc Mining. I. Production of High-Cadmium Rice on the Paddy Fields in Lower Reaches of the Mine Station

Takijima, Y.; Katsumi, F.; Fukui Agric. Exp. Stn., Fukui, Japan

Soil Sci. Plant Nutr. (Tokyo)(SSPNAW) 1973, 19(1), 29-38; 1973

RICE; SOILS; CADMIUM; DISTRIBUTION; HEAVY METALS; ZINC MINING; ZINC; PADDIES; PLANTS

702
Cadmium Contamination of Soils and Rice Plants Caused by Zinc Mining. 4. Use cf Soil Amendement Materials for the Control of Cadmium Uptake by Plants

Takijima, Y.; Katsumi, F.; Fukui Agric. Exp. Stn., Fukui, Japan

Soil Sci. Plant Nutr. (TOKYO), 19(4), 235-44; 1973

PLANTS; ZINC MINING; UPTAKE; CADMIUM; RICE; SOILS; CALCIUM; SILICATES; ZINC; PHOSPHATES; LIME

703
Cadmium Contamination of Soils and Rice Plants Caused by Zinc Mining. 3. Effects of Water Management and Applied Organic Manures on the Control of Cadmium Uptake by Plants

Takijima, Y.; Katsumi, F.; Koizumi, S.; Fukui Agric. Exp. Stn., Fukui, Japan

Soil Sci. Plant Nutr. (Tokyo)(SSPNAW) 1973, 19(3), 183-193; 1973

CADMIUM; RICE; MANURE; STRAW; COMPOST; SOILS; PLANTS; ZINC MINING; ZINC; UPTAKE; WATER; WATER MANAGEMENT

704
Cadmium Contamination of Soils and Rice Plants Caused by Zinc Mining. 2. Soil Conditions of Contaminated Paddy Fields Which Influence Heavy Metal Contents in Rice

Takijima, Y.; Katsumi, F.; Takezawa, K.; Fukui Prefect. Agric. Exp. Stn., Fukui, Japan

Soil Sci. Plant Nutr. (Tokyo)(SSPNAW) 1973, 19(3), 173-182; 1973

SOILS; RICE; CADMIUM; HEAVY METALS; PADDIES; ZINC; ZINC MINING; PLANTS

705
Leaching of Arsenic from Soil

Tammes, P.M.; De Lint, M.M.; Laboratory for Research on Insecticides, Wageningen, Netherlands; Institute of Agricultural Engineering and Rationalization, Wageningen, Netherlands

Neth. Journal of Agriculture Science, 17, 1969, 128-132

PHYTOTOXICITY; SOILS; LEACHING; ARSENIC; CONCENTRATION; POTATOES; HALF-LIFE

A description was given of two field trials carried out over successive years in the Netherlands, concerned with phytotoxicity of the soil and its arsenic content. Even after extremely high levels (up to 25 times the used dose of arsenite for killing haulms of potatoes) phytotoxicity gradually disappeared during subsequent years. The arsenic was leached from the top soil. A half-life of 6.5 plus or minus 0.4 years was calculated from 6 dosage steps in two experiments.

706
Complex Reactions of Zinc With Organic Matter Extracted from Sewage Sludge

Tan, K.H.; King, L.D.; Morris, H.D.

Soil Sci. Soc. Amer. Proc., 35, 748-751; 1971

ZINC; SEWAGE SLUDGE; HUMUS

707
Heavy Metals in Fertilizers

Tanahashi, Y.; Tokyo Fertilizer Inspection Office, Ministry of Agriculture and Forestry, Tokyo, Japan

Hiken Kaiho (HIKABG), 25(5), 8-20; 1972

FERTILIZERS; METALS; SOILS; PLANTS; TRACE ELEMENTS

708
Distribution of Lead Chelate in the Transpiration Stream of Higher Plants

Tanton, T.W.; Crowdy, S.H.

Pestic. Sci., 2(5), 211-13; 1971

REVIEW; FDTA; LEAD; CHELATES; PLANTS; LEAD CHELATE; STREAMS; FUNGICIDES

A reivew with 12 references on the use of 1:1 FDTA lead chelate as a free space marker in plants. The chelate can be used for the study of the transport of systemic fungicides.

709
Reductive Degradation of Humic Acids from 3 New Zealand Soils

Tate, K.R.; Goh, K.M.

N.Z.J. Sci., 16(1), 59-69; 1973

PHENOL; ALIPHATIC; SODIUM; AMALGAM; THIN LAYER CHROMATOGRAPHY; ANALYSIS; HUMIC ACIDS; DEGRADATION; SOILS

710
BHC Residues in the Environment

Tatsukawa, R.; Wakimoto, T.; Ogawa, T.

Part of Matsumura, Fumio, G. Mallory Boush and Tomomasa Misato (Ed.). Environmental Toxicology of Pesticides. Proceedings of a United States-Japan Seminar. Oiso, Japan, October, 1971. Illus. Maps. Academic Press: New York, NY; London, England, 229-238; 1972

PLANTS; HUMANS; TISSUE; AIR; WATER; SOILS; BHC; RESIDUES

711
The Association of Trace Elements with Manganese Minerals in Australian Soils

Taylor, R.M.; McKenzie, R.M.

Austr. J. Soil Res., 4, 29-39; 1966

TRACE ELEMENTS; MANGANESE; MINERALS; SOILS

712
Chemistry of Soil Arsenic

Thomas, J.R.

Diss. Abs., 15, 2379-2380; 1955

SOILS; ARSENIC

713
IR Spectra and Differential Thermograms of Lignins and Soil Humic Materials Saturated with Different Cations

Thompson, S.O.; Chesters, G.

J. Soil Sci., 21(2), 1970, 265-272

COPPER; CALCIUM; LIGNIN; THERMOGRAMS; SOILS; HUMIC; CATION; INFRARED SPECTROSCOPY; DIFFERENTIAL THERMOGRAMS

714
Heavy Metal and Radionuclide Behavior in Soils and Plants

Tiffin, L.O.; Lagerwerff, J.V.; Taylor, A.W.; Agricultural Chemicals Management Laboratory; Agricultural Environmental Quality Institute; Beltsville Agricultural Research Center, Beltsville, MD 20705

Prepared in Collaboration with the Division of Biomedical and Environmental Research U.S. Atomic Energy Commission under the terms of the AEC Research Contract AT(49-7)-1; 1973, December

HEAVY METALS; RADIONUCLIDES; SOILS; PLANTS

715
The Interaction of Some Heavy Metal Cations and Silicic Acid at Low Concentrations in the Presence of Clays

Tiller, K.G.

Trans. 9th Int. Congr. Soil Sci., 2, 567-575; 1968

SILICIC ACID; CLAY; PH; ADSORPTION; SILICATES; TRACE ELEMENTS; HEAVY METALS; COBALT; NICKEL; ZINC; CATIONS

The amounts of Co, Ni and Zn adsorbed by clays increased with the amount of silicic acid adsorbed. There were no Co and Zn compounds at high cation concentrations and/or high pH. The reaction between these was promoted by silic acid depending on the adsorption of reacting species at adjacent sites such as the edge surfaces of layer silicates. Results suggest that silicic acid in the soil solution may have an important role in reactions that control the availability of trace elements.

716
The Specific Sorption of Cobalt and Zinc by Layer Silicates

Tiller, K.G.; Hodgson, J.F.

Part of Clays and Clay Minerals, Proc. 9th Nat'l. Conf., Pergamon Press, N.Y., (393-403); 1962

SORPTION; COBALT; ZINC; SILICATES; LAYER SILICATES

717
Soil Zinc and Its Uptake by Plants. 2. Soil Chemistry in Relation to Prediction of Availability

Tiller, K.G.; Honeysett, J.L.; De Vries, M.P.

Aust. J. Soil Res., 10(2), 1972 (Received 1973), 165-182

CLOVER; WHEAT; RADIOISOTOPES; CHEMICAL ISOTHERM; DESORPTION; ZINC; SOILS; UPTAKE; PLANTS; AVAILABILITY PREDICTION; AVAILABILITY; SOIL ZINC

718
Soil Zinc and Its Uptake by Plants. I. Isotopic Exchange Equilibria and the Application of Trace Techniques

Tiller, K.G.; Honeysett, J.L.; De Vries, M.P.

Austr. J. Soil Res., 10, 151-164; 1972

SOILS; ZINC; UPTAKE; PLANTS; EXCHANGE EQUILIBRIA; ISOTOPIC EXCHANGE; TRACER TECHNIQUES

719

Movement of Complex Compounds through Different Soil Types

Todorovic, Z.; Filip, A.; Boris Kidric Institute of Nuclear Sciences, Belgrade, Germany

CONF-670641; STI/PUB-158, Symposium on the Use of Isotope and Radiation Techniques in Soil Physics and Irrigation Studies, Istanbul, (241-249); 1967

MOVEMENT; AMMONIUM COMPOUNDS; EDTA; HYDROXIDES; SALTS; SOILS; SULFURIC ACID; TRACER TECHNIQUES; TRANSPORT; WATER; POTASSIUM COMPOUNDS; SODIUM COMPOUNDS; CHROMIUM 51; COBALT 60; IODINE 131; IRON 59; SULFUR 35; ZINC 65

Results of the behavior of complex compounds of zinc (bivalent), iron (trivalent), cobalt (trivalent) and chromium (trivalent) on passing through four sorts of soils are given. The soils had a dominant content of sand, clay, humus and carbonate. The investigations were carried out by the radioactive tracer technique. The complexing was carried out with Na-citrate, EDTA, Na-thiocyanate, potassium cyanide, ammonium-hydroxide, Na-oxalate, Na-tartrate and Na-citrate. The effect of the excess complexing agent on the percentage of the ccmplex compound in the eluate, retention and spread of the elution curve, is shown. The investigations were carried out on a column always filled with the same quantity of soil of given granulation. The movement of the complex compound was observed by taking samples of the eluate and X plus or minus (o) were determined as a measure for the retardation and spread of the complex compound waves. The smaller the difference between retardation (S) and free volumume (X)(0) and the smaller the standard deviation, the smaller was the retardation of the complex compound. From these characteristics and from those of the elution curves for I 131 and S 35, which are considered to be passing through the soil without considerably difficulty, those complex compounds which showed the least retardation and wave spread on passage through the soil type investigated were determined.

720

Microbial Conversion of Mercury Compounds

Tonomura, K.; Furukawa, K.; Yamada, M.

Part of Matsumura, Fumio, G. Mallory Boush and Tomomasa Misato (Ed.). Environmental Toxicology of Pesticides. Proceedings of a United States-Japan Seminar., Oiso, Japan, October, 1971. Academic Press: New York, N.Y., U.S.A.; London, England. (115-133) 637p.

MICROBIOLOGY; MERCURY; CONVERSION

721

Microbiological Leaching of a Zinc Sulfide Concentrate

Torma, A.E.; Walden, C.C.; Branion, R.M.R.

Bioeng., 12(4), 1970, 501-517

MICROBIOLOGY; LEACHING; ZINC; ZINC SULFIDE

722

Wet Treatment of the Leaching Residue from Zinc Smelting

Tozawa, K.

Tohoku Daigaku Senko Seiren Kenkyusho Iho (TDSSA2), 28(2), 237-253; 1972

REVIEW; ZINC; LEACHING; RESIDUES; SMELTERS

723

Effect of Soil Moisture on the Dynamics of the Labile Forms of Copper and Manganese Distribution

Treiman, A.A.

Part of Mikroelem. Biosfere Primen. Ikh. Sel. Khoz. Med. Sib. Dal'Nego Vostoka, Dokl. Sib. Konf., 3rd (27BUAA), 1969; Filippov, V.R. (Ed.), Akad. Nauk SSSR, Sib. Otd., Buryat. Filial, Ulan-Ude, USSR (125-128); 1971

SOIL MOISTURE; LABILE FORMS; DISTRIBUTION; MOISTURE CORRELATION; SOILS; COPPER; MANGANESE

724

Pollution of Groundwater Due to Municipal Dumps

Tremblay, J.J.; Anger, H.; D'Cruz, J.

Canada Dept. of Energy Mines and Resources, Technical Bulletin 42; 1971

BIBLIOGRAPHY; ANALYSIS; EXPERIMENTAL DUMPS; EXPLOSIVE MATERIALS; GASES; LEACHING; LEACHATES; LANDFILLS; WATER; GROUND WATER; MUNICIPAL DUMPS

An extensive bibliography and short review article on the composition of landfill material, the leachate compositions, research on progress internationally and legislation on ground water pollution from landfill sites.

725
Translocation and Distribution of Lead 210 and Polonium 210 Supplied to Tobacco Plants

Tso, T.C.; Dept. of Agriculture, Beltsville, Md, Pisenne, Isabel

Radiat. Bot., 8, 457-462 (1968, December); 1968

ABSORPTION; AGE; DISTRIBUTION; METABOLISM; ROOTS; SOILS; LEAD 210; POLONIUM 210; LEAVES; STEMS; TOBACCO; PLANTS

Lead 210 and polonium 210 were supplied to tobacco plants (NICOTIANA TABACUM L. cv. maryland catterton) from soil, stem, and leaf surface to study the patterns of translocation and distribution of these elements. Test plants took up Po 210 and Pb 210 from roots or stems and the elements were distributed to various tissues. Direct absorption of Po 210 is therefore considered a major source of Po 210 supply, in addition to that from ingrowth of Pb 210 in leaf tobacco. A higher concentration of Pb 210 accumulated in younger upper leaves than in older lower leaves, while a higher concentration of Po 210 accumulated in older lower leaves than in younger upper leaves. When the two elements were applied to the leaf surface, little translocation or redistribution of Pb 210 was found from one leaf area to other leaf areas, but a very small portion of Po 210 applied on younger upper leaves transferred to older lower leaves. Po 210 applied on older lower leaves, however, remained where placed.

726
Limited Removal of Polonium-210 And Lead-210 From Soil and Fertilizer by Leaching

Tso, T.C.; U.S. Dep. Agric., Beltsville, Md

Agron J 62(5), 1970, 663-664.; 1970

ROOTS; ABSORPTION; POLONIUM; REMOVAL; SOILS; LEAD; AGITATION; LOAM; RAINFALL; IRRIGATION; PLOWING; EROSION; FERTILIZERS; LEACHING

In laboratory experiments using a loamy potting soil, both polonium 210 and lead 210 were leached out from soil and fertilizer mixtures without mechanical agitation. Polonium 210 and lead 210 leaching was increased by mechanical agitation but polonium 210 was leached much more easily and a higher percentage was removed from soil than from fertilizers. Results suggest the possible removal of limited amounts of polonium 210 and lead 210 from soil and fertilizer through rainfall or irrigation, and an increase in this removal by plowing or erosion.

727
Sources of Environmental Pollution: Provisional Standards and Preventive Measures--Soil

Tsuru, S.

Jap. J. Clin. Med., 31, 1933-1937; 1973, June

SOILS; POLLUTION SOURCES; INDUSTRY; CRITERIA; ABATEMENT

728
Change in the Mobility of Copper and in its Availability to Plants During a Reaction with Organic and Inorganic Parts of the Soil

Tsyplenkov, V.P.; USSR

Vestn. Leningrad. Univ., Biol.(VLUBB6) 1972, (4) 133-7; 1972

CLAY; COPPER; SOILS; PLANTS; HYDROMICA; BARLEY; KAOLIN; MOBILITY; HUMUS

729
Nature of Iron and Aluminum Hydrous Oxides Precipitated in Montmorillonite Suspensions and Reduction of Structural Ferric Iron in Nontronite

Tullock, R.J.; Purdue Univ., Lafayette, Indiana

Thesis, Purdue University, Lafayette, Indiana, Univ. Microfilms, Order No. 73-15, 878; Diss. Abstr. Int. B, 34(1), 27-28; 1973

ALUMINUM HYDROXIDES; REDUCTION; FERRIC HYDROUS OXIDES; IRON HYDROXIDES; IRON; ALUMINUM; OXIDES; MONTMORILLONITE; NONTRONITE

730
Effect of Fertilizers on the Content of Mobile Trace Elements in Soil

Turbas, E.; Kalmet, R.; Riis, V.

EESTI Pollumajanduse Akad. Tead. Toode Kogumik (EPSMA8) No. 73, () 82-91

SOILS; LIMING; MICRONUTRIENTS; MOBILITY; MANURE; TRACE ELEMENTS; LIME; FERTILIZERS

731
Varying Persistence of Polychlorinated Biphenyls in Six California Soils Under Laboratory Conditions

Twata, Y.; Westlake, W.E.; Gunther, F.A.

Bull. Environ. Contam. Toxicol., 9(4), 204-211; 1973, April

ANALYSIS; CHLORINATED HYDROCARBONS; PESTICIDES; SOILS; PERSISTENCE; PCB; POLYCHLORINATED BIPHENYLS; FALLOUT; AIR

The PCBs had different lives in different soils in their original form. However, they could alter in composition and possibly be spread by aerial fallout giving widespread contamination.

732
Heavy Metals Pollute Nature, May Reduce Productivity

Tyler, G.

Ambio, 1(2), 52- 59; 1972

ACCUMULATION; WOODLAND; MIRES; MEADOWS; ECOSYSTEMS; ATOMIC ABSORPTION SPECTROPHOTOMETRY; MOSSES; SEASHORE; BOG PEAT; HEAVY METALS; DECOMPOSITION; MINERALIZATION; BOGS; FORESTS

Deposition and accumulation of heavy metals in terrestrial sites (woodland, mires, meadows) is surveyed. Major ecosystem components were anlayzed by atomic absorption spectrophotometry. Increase in atmospheric deposition is first traced in carpet-forming mosses and the highest concentrations are in southwestern Scandinavia. Metal turnover is illustrated with examples from seashore meadows. An accumulation surface in bog peat is discussed, indicating movements of heavy metal ions, at least under acid, reducing conditions. Possible effects of increasing heavy metal deposition on decomposition, mineralization and primary productivity are indicated.

733
Primary Production and Distribution of Organic Matter and Metal Elements in Two Heath Ecosystems

Tyler, G.; Gullstrand, C.; Holmquist, K.L.; Kjellstrand, A.M.; Dep. Plant Ecol., Univ. Lund, Lund, Sweden

J. Ecol. (JECOAB), 61(1), 251-68; 1973

HEATH ECOSYSTEM; METALS

734
Zinc Adsorption by Calcareous Soils.

Udo, E.J.; Bohn, H.L.; Tucker, T.C.; Univ. Ibadan, Nigeria

Proc. Soil Sci. Soc. Am., 34, 405-407; 1970

CALCAREOUS SOILS; ZINC HYDROXIDE; ZINC; ADSORPTION; SOILS; LANGMUIR EQUATION

Different calcareous soils (0.4-11.4% $CaCO_3$, 0.09-1.16% organic matter) were shaken with dilute $ZnSO_4$ for 1 hour (2 g soil and 40 ml $ZnSO_4$), and the Zn remaining in solution was measured. Adsorption maxima, calculated by the Langmuir equation, were correlated with CO_3 and organic-matter levels; when added Zn exceeded the adsorption maxima, values of the $(Zn)(OH)_2$ product corresponded to the solubility of Zn hydroxide or carbonate, while at lower Zn adsorption and/or in the absence of CO_3 the ion product was equal to the solubility of Zn silicate in the presence of amorphous SiO_2 (about 1E-18 to 1E-19).

735
Metals from Privation to Pollution

Ulmer, D.D.

Fed. Proc., 32(7), 1758-1765; 1973

HUMANS; BIOLOGICAL FUNCTION; LEAD; MERCURY; REDISTRIBUTION; SOILS; WATER; AIR

736
Model for Environmental Transport of Automotive Lead

Vaitkus, D.R.; Edwards, H.W.; Colorado State University, Fort Collins, CO 80521

Part of Edwards, H.W. (Ed.), Impact on Man of Environmental Contamination Caused by Lead, Interim Report, July 1, 1971-June 30, 1972 (p. 166-180) 241; 1972

MODEL; TRANSPORT; ACCUMULATION; LEAD; ATMOSPHERIC TRANSPORT; GRAVITATIONAL SETTLING; WASHOUT; RAINOUT; MIGRATION; RETENTION; SOILS; AUTOMOBILE EMISSIONS

Development of a model for short-range environmental transport and accumulation of automotive lead is an integral part of the Colorado State University interdisciplinary study of environmental lead pollution. Atmospheric transport of lead from a highway and its removal from the atmosphere by gravitational settling, washout, and rainout are coupled to migration and retention in soil. The mathematical model consists of a system of linear, ordinary differential equations which quantitatively interrelates the transport and accumulation mechanisms. Numerical integration schemes were employed to solve the system of equations. Input consists of source characteristics, meteorological parameters, and initial conditions. Output consists of lead concentrations, fluxes, and accumulations as functions of space and time. Preliminary results indicate that the system of equations is well-behaved, and output is consistent with expected system behavior.

737
Model for Environmental Transport of Automotive Lead

Vaitkus, D.R.; Edwards, H.W.; Johnson, G.R.; Department of Mechanical Engineering, Colorado State University, Fort Collins, CO; University Computer Center; Colorado State University, Fort Collins, CO

Part of Hemphill, D.D. (Ed.), Seventh Annual Conference on Trace Substances in Environmental Health, Held at Memorial Union, University of Missouri-Columbia, Columbia, MO, June 12-14, 1973; 1973

MODEL; TRANSPORT; ACCUMULATION; GRAVITATIONAL SETTLING; WASHOUT; RAINOUT; MIGRATION; RETENTION; HIGHWAY PROXIMITY; SOILS; AIR

Development of a model for short range environmental transport and accumulation of automotive lead is part of the Colorado State University interdisciplinary study of environmental contamination by lead. Atmospheric transport of lead from a highway and its removal from the atmosphere by gravitational settling, washout and rainout are coupled to migration and retention in soil. The mathematical model consists of a system of linear, ordinary differential equations which quantitatively interrelates the transport and accumulation mechanisms. The model will be discussed in terms of predictive capabilities and correlation with experimental results from field measurements.

738
The Distribution of Lead Along a Line Source (Highway)

Vandenabeele, W.J.; Wood, O.L.; Utah State University, Department of Soil Science and Biometeorology, Logan, UT 84321

Chemosphere, 5, 221-6; 1972

LEAD; SOILS; HIGHWAY PROXIMITY; AUTOMOBILE EMISSIONS; ADSORPTION; ATOMIC ABSORPTION SPECTROPHOTOMETRY

The authors found, as authors have, that the concentration of lead in soil decreased rapidly with distance away from the highway. In contrast to other authors, they found lead not only on the surface but at a depth of 10 cm. Experiments showed that this could be caused by the use of sodium-chloride for melting snow and also by the low winter temperatures. As long as there are available carbonates in the soil the lead will be precipitataed; then much of the lead will be adsorbed. The adsorbed lead will be leached out by a sodium chloride solution. A low temperature (winter) reduces the amount adsorbed.

739
Isolation from Soil of Phenol-Utilizing Organisms and Metabolic Studies on the Pathways of Phenol Degradation

Varga, J.M.; Neujahr, H.Y.; Dep. Pure Appl. Biochem., R. Inst. Technol., Stockholm, Sweden

Plant Soil (PLSOA2), 33(3), 565-71; 1970

PHENOL; METABOLISM; SOILS; MICROBES; MICROORGANISMS; BACTERIA; YEAST; FUNGI; DEGRADATION; FISSION

Thirteen different strains of microorganisms (6 Bacteria, 3 yeasts, and 4 mycelial fungi) capable of growing on phenol as a major carbon source were isolated from soil. Oxidation of phenol and catechol by these organisms was studied using the manometric technique and the reaction products were identified by spectrophotometry. In most of the isolated strains the pathway phenol greater than catechol greater than CIS, cis-muconate is the main route of phenol degradation. In one of the bacterial strains extradiol type of catechol cleavage exists together with the intradiol ring fission. In two of the strains the pattern of oxygen consumption in the presence of phenol and catechol indicated that catechol was not the first or not the only intermediate in the degradation of phenol by these strains. Spectra of the oxidation products indicated the presence of a reaction product different from either degradation or alpha-hydroxy muconic semialdehyde. Washed cells from most of the strains accumulated colored products (probably quinones) when incubated with phenol or catechol.

740
Stability and Behavior of Complexes of Copper, Zinc, Iron, Manganese, and Lead with Humic Substances of Soils

Verloos, M.; Cottenie, A.; Fac. Agron. Sci., State Univ., Ghent, Belgium

Pedologie(PEDOAZ) 1972, 22(2), 174-84; 1972

HUMATE STABILITY; TRACE ELEMENTS; PH; COPPER; LEAD; ZINC; MANGANESE; IRON; HUMUS; SOILS

741
Research into Emission of Lead, Zinc and Fluorine and the Resulting Damage Caused to Plants and Animals

Vetter, H.; Maehlhop, R.; Landwirtsch. Unters. Forschungsanst., Oldenburg, West Germany

Landwirtsch Forsch, 24(3/4), 294-315; 1972

LEAD; ZINC; FLUORINE; PLANTS; ANIMALS; FUMES; GASES; INDUSTRIAL EMISSIONS; SOILS; LIVER; COPPER; RESORPTION; DEGRADATION; METALS; TRACE ELEMENTS

For 2 years, systematic research was carried out by the Agricultural Research and Development Institute in Oldenburg, West Germany in the field of emission. The industrial emission in area I enriched both soil and plants. This enrichment was confirmed up to 12 km from the industrial center. In the case of F, the enrichment increase doubled from there to 700m from the work center; Cu increased 10 times, Pb increased 50-120 times and Zn increased 100-150 times. From this point to the industrial center, the enrichment in the pasture increased (established in November) up to 10 times for F, up to twice as much for Cu, up to 100 times as much for Pb and up to 40 times as much for Zn. The fumes and gases emitted towards the eastern section appeared to be of a different composition from those which drifted westward, probably due to the fact that they had to cross the moist air which covered the river. There was considerable damage caused to the growth of plants and animals by the industrial emission distance of 3 km from the industrial center. The damage was mainly caused by Pb and Zn, probably also by F, or other harmful materials. Zinc harmed the animals mainly by a degradation in the rate of Cu resorption. The resulting deterioration in the Cu supply for the cattle would be worse, were it not for the fact that Cu was emitted. Other materials, besides Pb, deteriorate animal health and growth, and the marginal content of Pb in the liver, which was taken as a measurement of the extent of damage to animals, was probably lower than usual. The overall damage per hectare to the plants and animals, as a result of industrial emission, was in the regions: (III) 3-2 km approximately 100%; (II) 2-1.5 km approximately 250%; (I) 1.5-1 km approximately 500%; and (Ia) up to 1 km approximately 1000%. In the region I the damage decreased rapidly with distance from the factory. Region I was further subdivided: (Ic) 1.5 to 1.25 kilometers approximately 500%; and (Ib) 1.25 to 1 kilometer approximately 750%. The inner zone Ia and/or Ib caused damage to the animals not only during the grazing time, but also because of the increase of harmful materials in the liver, in the subsequent stages when the animals were on other pastures. Agricultural use of zone Ia and Ib was not recommended. Zone IV, may have temporary damages. Recommendations were made on how to lower the damage caused by emission.

742
Chemistry and Availability of Micronutrients in Soils

Viets, F.G.

J. Agric. Food Chem., 10, 174-8; 1962

MICRONUTRIENTS; SOILS; CHEMISTRY; AVAILABILITY

743
Distribution of Lead-210 And Radium-226 In Certain Soils

Vilenskii, V.D.

Geokhimiia, 12, 1969, 1507-1510

DISTRIBUTION; LEAD; RADIUM; SOILS

744
The Geochemistry of Rare and Dispersed Chemical Elements in Soils

Vinogradov, A.P.

Translated from Russian by Consultants Bureau, Inc. New York; 1959

GEOCHEMISTRY; SOILS; DISPERSION

745
Effect of Natural Extracts Upon the Sorption of Some Radioisotopes by the Soil

Volkova, M.Y.; Makhonina, G.I.; Titlyanova, A.A.

Pochvovedenie, 3, 52-57; 1964

STRONTIUM 90; RUTHENIUM 106; CADMIUM 115; CERIUM 144; CHELATION; RUBIDIUM 85; SOILS; ADSORPTION; RADIOISOTOPES; BIRCH; PINE NEEDLES; ASPEN; BIRD CHERRY; FERNS; LEAVES; PLANTS

A study was carried out of the desorbing properties of some natural extracts (water extracts from yellow leaves of aspen, birch, bird cherry, ferns, and pine needles) in respect to following radioisotopes: Rb 85, Sr 90, Ru 106, Ag 110, Cd 115, and Ce 144. All the above elements increased their mobility under the influence of extracts. It is supposed that the desorbing effect of the extracts is connected with the formation of soluble complex compounds of the above metals with organic substances, the desorption effect of extracts on Rb and Sr depends upon the cations present in the extracts.

746
Degradation of Monosodium Methanearsonic Acid by Soil Microorganisms

Von Endt, D.W.; Kearney, P.C.; Kaufman, D.D.; Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland 20705

Agricultural and Food Chemistry, 16, 17-20; 1968, January-February

MSMA; DEGRADATION; SOILS; ORGANIC ARSENICALS; STERILITY; THIN LAYER CHROMATOGRAPHY; ARSENIC; SODIUM HYDROGEN METHANEARSONATE; CHROMATOGRAPHY

Monosodium methanearsonic acid (MSMA) was chosen as the model compound for a study of the degradation of organic arsenicals in soil. Comparison of evolved carbon dioxide-14 from four sterile and nonsterile soils 60 days after treatment with MSMA-carbon-14 showed that from 1.7 to 10.0% of the MSMA-carbon-14 was degraded in nonsterile soil, as compared with 0.7% in steam-sterilized controls. Four soil microorganisms isolated in pure culture degraded from 3 to 20% of the MSMA-carbon-14 to carbon dioxide-14 when grown in liquid culture containing 10 ppm of MSMA and 1 gram per liter of yeast extract. Thin-layer chromatography (TLC) on silica gel G-coated plates effected the separation of MSMA, arsenate, and arsenite. Only arsenate and MSMA were detected after TLC of extracts from the soil and microbial growth experiments. These data indicate that soil microorganisms are at least partly responsible for MSMA degradation in soil.

747
Heavy Metal Contamination by Industrial Immission. Soil, Forage Plants and Cattle Livers in the Nordenham Area

Wagner, K.H.; Siddiqi, I.; Institut fur Ernahrungswissenschaft II der Universitat Giessen, German Federal Republic

Naturwissenschaften (NATWAY), 60(3), 161; 1973

METALS; LEAD; EMISSIONS; MILLS; SOILS; PLANTS; LIVER; CATTLE; FORAGE; CADMIUM; ZINC; DEFECTIVE FILTERS; INDUSTRIAL EMISSIONS; LEAD PLANTS

The Pb, Cd and Zn contents of the 0-5 and 5-10 cm layers of soil and of the vegetation 0.75-2.5 km away from a Pb plant with a defective purification filter are tabulated. The Pb, Cd and Zn contents of soil 2.5 km away were four times those of ordinary soil, and the contents in the vegetation were also very high.

748
Toxic Materials in Soil Amendments

Wagner, K.H.; Siddiqi, I.; Inst. Ernaehrungswiss. II, University Giessen, Giessen, Germany

Naturwissenschaften (NATWAY), 60(3), 160-161; 1973

SOILS; CARCINOGENS; COMPOST; WASTES; SLUDGE

749
Dependence of the Lead Content of Plants on Lead Concentration in Soil

Wagner, K.H.; Siddiqi, I.

Naturwissenschaften, 60(4), 200; 1973

BARLEY; ADSORPTION; ATMOSPHERE; AIR; PLANTS; LEAD; SOILS

750
The Effects of Horticultural Practices on Man and His Environment

Walker, K.C.

Hortscience, 5(4), 239-242; 1970

PESTICIDES; PLANTS; NUTRITION; SALINITY; WATER; SMOKE; SOILS; EROSIONS; HORTICULTURE

751
Where Have all the Toxic Chemicals Gone?

Walker, W.H.

Ground Water, 11(2), 11-20; 1973, April

LEACHING; LEACHATES; MINE SHAFTS; REGULATIONS; SOILS; LANDFILLS; UNDERGROUND

A general survey, illustrated with case histories of the threat to water supplies by the indiscriminate disposal of toxic materials.

752
Microbial Versus Chemical Degradation of Malathion in Soil

Wallace, A. Mississippi Agric. For. Exp. Stn., Mississippi State Univ., State College, Ms

J. Environ. Qual.(JEVQAA) 1973, 2(2), 229-32; 1973, May 15

BOTANY; HEALTH; SAFETY; PROGRESS REPORTS

Malathion degradation in 3 mississippi soils was more rapid under non-sterile than under sterile conditions, which indicates microbial involvement. Malathion degradation under sterile conditions was taken to be chemical degradation. Malathion was stable under neutral or acid pH conditions, but was susceptible to hydrolysis under alkaline conditions.

753
Behavior of Certain Synthetic Chelating Agents in Biological Soil Systems. Annual Progress Report

Wallace, A.

California Univ., Riverside USA. Dept. of Soil Science and Agricultural Engineering, Contract AT(04-3)-34. (UCR-34-P-51-36), 15 May, 1973; 1973, May 15

BOTANY; PROGRESS REPORTS; CHELATES

754
Effects of Chelated and Nonchelated Cobalt and Copper on Yields and Microelement Composition of Bush Beans Grown on Calcareous Soil in a Glasshouse

Wallace, A.; Mueller, R.T.; Dep. Soil Sci. Agric. Eng., Riverside, Calif.

Soil Sci. Soc. Amer., Proc.(SSSAA8) 1973, 37(6), 907-8; 1973

METALS; CHELATES; BEANS; EDTA; COBALT; COPPER; IRON; SOILS; CALGARELLIS SOIL

755
Diffusion of Zinc in Soil. 2. The Influence of Soil Bulk Density and Its Interaction with Soil Moisture

Warncke, D.D.; Barber, S.A.; Purdue Univeristy, Lafayette, In

Soil Sci. Soc. Am., Proc. 1972, 36(1), 42-46; 1972

CHLORIDE; TORTUOSITY; SOILS; ZINC; REDUCTION; DIFFUSION; WATER; SOIL MOISTURE

In 5 soils at 3 moisture levels the diffusion path was least tortuous near 1.3 g/cm3. the order of influence of soil bulk density on tortuosity was 1.6 greather than 1.5 greater than 1.3 g/cm3. soil bulk density interacted significantly with soil mositure in affecting Zn diffusion coefficients. At 20 and 30% moisture, the Zn diffusion rate reached a maximum near 1.5 g/cm3. as soil moisture increased, the reduction in the effect on interaction of Zn with soil was greater than the effect of tortuosity, in determining the effective rate of Zn diffusion. When bulk density increased from 1.5 to 1.6 g/m3 an increase in the degree of interaction and tortuosity caused a sharp decrease in the Zn diffusion coefficient.

756
Diffusion of Zinc in Soils. 3. Relation to Zinc Adsorption Isotherms

Warncke, D.D.; Barber, S.A.

Soil Sci. Soc. Amer., Proc. (SSSAA8) 1973, 37(3), 355-8; 1973

ZINC; DIFFUSION; SOILS; DESORPTION; CATIONS EXCHANGE; CATION; BUFFERING CAPACITY

757
Bio Geochemistry in Canada

Warren, H.V.

Endeavour (Engl Ed) 31(112), 46-49; 1972

REVIEW; PLANTS; MINERALS; LEAD; SOILS; BIOGEOCHEMISTRY

758
Variations in the Copper, Zinc, Lead and Molybdenum Contents on Some Vegetables and Their Supporting Soils

Warren, H.V.; Delavault, R.E.

Geol. Soc. Am. Mem., 97-108; 1971

INDUSTRY; COPPER; ZINC; LEAD; MOLYBDENUM; VEGETABLES; SOILS

759
Base Metal Pollution in Soils

Warren, H.V.; Delavault, R.E.; Cross, C.H.

Part of Hemphill, Delbert D. (Ed.). Proceedings of University of Missouri, 3rd Annual Conference of Trace Substances in Environmental Health. University of Missouri, Columbia, MO (p. 9-19) 391; 1970

METALS; SOILS

760
Metal Pollution - A Growing Problem in Industrial and Urban Areas

Warren, H.V.; Delavault, R.E.; Fletcher, K.V.

Can. Min. Metall. Bull. pp. 34-45; 1971, July

CADMIUM; COPPER; METALS; LEAD; MONITORING; NICKEL; SOILS; ZINC; MOLYBDENUM; MANGANESE; COBALT; VEGETABLES; URBAN

Report on a survey carried out on the concentrations of zinc, copper, lead, molybdenum, cadmium, manganese, nickel, and cobalt in both soil and vegetables in Canada and Britain. Normal and abnormal values are suggested.

761
Investigations on the Damage to Crop Plants Near a Metallurgical Combine

Warteresiewicz, M.; Szalonek, I.

Mitt. Forstl. Bundes-Versuchsanst Wien, 97(1), 217; 1972

BARLEY; POTATOES; FODDER; BEETS; SULFUR DIOXIDE; DUST; AIR; GROWTH RATE; WATER LOSS; PIGMENT; WATER; CROPS; PLANTS

762
Absorption of Arsenic and Lead by Eggplant from Soil and Their Translocation

Watanabe, T.; Fujimoto, Y.; Nakamura, H.; Agric. Chem. Inst. Stn., Minist. Agric. For., Kodaira, Japan

Noyaku Kensasho Hokoku, 11, 101-105; 1971

ARSENATE; LEAD; ANALYSIS; EGGPLANT; SOILS; PLANTS; TRANSPORT; ABSORPTION; TRANSLOCATION

763
COMPARISON OF CHROMIUM-51 VERSENATE AND TRITIATED WATER MOVEMENT IN A TERMITE MOUND AND SOIL

WATSON, J.P.

SOIL SIC. 111(3), 1971, 188-191

GOLIATH TERMITE; TERMITE; INSECTS; SOILS; WATER; CHROMIUMS; VERJENATE; TRITIATED WATER

764
Great Britain Ministry of Agriculture Fisheries and Food Technical Bulletin No. 21. Trace Elements in Soils and Crops. Proceedings of a Conference

Webber, J.

G B Minist Agric Fish Food Tech Bull No. 21; 1971

PLANTS; IRON; COPPER; MOLYBDENUM; BORON; MANGANESE; SOILS; CROPS; TRACE ELEMENTS; REVIEW

765
Effects of Toxic Metals in Sewage on Crops

Webber, J.; Agric. Dev. Advis. Serv., Leeds, England

Water Pollut. Contr. (WPOCAH) 1972, 71(4), 404-13; 1972

SEWAGE; SLUDGE; CROPS; COPPER; ZIN NICKEL; CHROMIUM; HEAVY METALS

Most of the toxicity symptoms arising from the use of sewage sludge on cropland comes from the presence of heavy metals such as zinc, copper, nickel, and sometimes chromium. Susceptibility to the effects of these metals varied from crop to crop, and the toxic effects were generally more serious at lower pH values. A Zn equiv. value was used to derive a singel figure for the total metal content of sludges, wherein Cu and Ni were considered to be 2 and 8 times, respectively, as toxic as Zn. The maximum amount of metals which can safely be aDDEd over a 30-50 year priod was 250 mg Zn kg at soil pH 6.5, and previous contaminations must be accounted for in this value.

766
Removal of Metal Ions by Soil

Wentink, G.R.; Etzal, J.E.; School of Civil Engineering, Purdue University, Lafayette, Indiana

Journal WPCF, 44(8), 1561-74; 1972, August

ION EXCHANGE; SOILS; ELECTROPLATING WASTES; CLAY; CATION EXCHANGE; CHROMIUM; COPPER; ZINC; EXCHANGE CAPACITY; MASS ACTION EFFECT; REGENERATION; LEACHING

Exchange capacity of the three soils tested increased as the clay mineral content increased and the particle size decreased. Complete removal of chrome was possible up to concentrations of 300 milligram per liter with any of the soil types tested. Removal of copper was complete after an initial conditioning period for any of the three soil types tested. Removal of zinc at application rates as high as 300 milligram per liter can be accomplished with an efficiency of no less than 99.7 percent. Mass-action effect was observable for all soil types tested when the chrome, copper, or zinc was applied individually. Removal of metal ions by the three soils types tested was accomplished by an ion exchange mechanism. Regeneration of the three soil types tested was found to be possible. Leachability of the exchanged ions in the soil types tested was essentially nonexistent when either tap water or deionized water was used as the leachate.

767

Plant Anomalies Related to Some British Columbia Ore Deposits

White, W.H.

Trans. Can. Inst. Mining Met. 53, 368-71; 1950

ORE; PROSPECTING; PLANTS; GEOCHEMISTRY; TREES; ZINC; COPPER

The value of anomalous metal contents of trees as an aid to the discovery of mineral deposits was tested under field conditions on 4 known ore deposits. Results indicate that a base-metal deposit, or any deposit containing Zn or Cu, casts a "metal shadow" into the overlying soil which remains approximately positioned above the deposit, regardless of the type of overburden or the movement of ground H_2O. The high content of Zn or Cu in trees growing within the limits of this shadow constitutes an anomaly which can be detected and plotted in the field. CA 44, 10614 (1950)

768

Mercury Levels in Soils of the Eastern United States

Wiersma, G.B; Tai, H.

Pesticides Monitoring Journal, 7(3/4), 214-216; 1974, March

CROPLAND; SOILS; MERCURY

Cropland and noncropland soils were sampled to determine levels of elemental mercury present in the upper three inches of soil. Results showed no difference in mercury levels between cropland and noncropland soils. Levels detected compared closely to levels found in similar studies. Actual mean levels of mercury residues in soils of the eastern United States ranged from 0.05 to 0.10 ppm.

769

Inter Conversion of Chloroneb and 2,5-Dichloro-4-Methoxy Phenol by Soil Microorganisms

Wiese, M.V.; Varga, J.M.

Pest Biochem. Physiol., 3(2), 214-222; 1973

FUNGICIDES; STABILITY; METHYLATE; DEGRADATION; SOILS; CHLORONEB; METHOXY; PHENOL; MICROORGANISMS

770

Lead in Soil and Plants

Wiklander, L.; Institutionen for Markvetenskap, Avd. for Marklara, Lantbrukshogskolan, Uppsala, Sweden

Grundforbattring, 24(2), 65-67; 1971

HIGHWAY PROXIMITY; LEAD; SOILS; PLANTS; GRASSES; AUTOMOBILE EMISSIONS; AIR

The Pb in grass and in the 0-1 cm layer of soil, undisturbed after autumn cultivation, was determined in samples collected at various distances from a road in June and was compared with the concentration in the 0-20 cm layer. The Pb concentration in the surface soil began to increase at 40 m from the road up to 9.5 and 33.4 ppm at 5.5 m for easily and difficultly soluble Pb, respectively. The grass from the roadside contained up to 567 ppm Pb.

771

Lead in Soil and Plants. 1. Influence of Motor Vehicles

Wiklander, L.; Inst. Markvetenskap Lantbrukshogsk., Uppsala, Sweden

Grundforbattring, 23, 163-169; 1971

LEAD; SOILS; PLANTS; SNOW; WHEAT STRAW; SPRUCE; TREES; HIGHWAY PROXIMITY; AUTOMOBILE EMISSIONS; AIR; SOLUBILITY

The Pb content of snow accumulated during winter and of the top cm of soil in spring showed that atmospheric deposition of Pb was high close to a main road in Uppsala and reached a normal value 30-45 m from it. The Pb content of soil at 10-15 cm was not affected by distance from the road. The Pb contents of wheat straw and Norwegian spruce were high near the road and normal 50 and 30 m respectively away from it. The soil of a Gothenburg park exposed to heavy traffic contained 12-117 ppm of easily soluble Pb and 69-425 ppm of total Pb.

772

Studies on the Sorption of Sodium Arsenate and Sodium Arsenite by Soil and Snythetic Iron and Aluminum Oxide

Wiklander, L.; Fredriksson, L.

Acta Agric. Suecanc., 1, 345-376; 1946

SODIUM ARSENATE; SODIUM ARSENITE; SYNTHETIC IRON; ALUMINUM OXIDE; IRON; SOILS; ARSENIC; ARSENATE; ARSENITE; SORPTION; SILICIC ACID

Different soils were shaken with known quantities of arsenate and arsenite solutions, ultra-filtered and the arsenic determined in the filtrate. Sorption of arsenate was rapid and reached equilbirum within one day. Sorption of arsenite was rapid to begin with, but was not complete after 30 days, nor was it so strong as with arsenate. Of the soils tested a brown earth had the greatest sorption capacity for As and a low-moor soil the least. The inorganic fractions seemed to be more active sorbing agents than the organic. Fe_2O_3 was particularly active and appeared to be the cause of a high sorption capacity of the brown earth. Additions of Fe_2O_3 produced practically 100% sorption of both arsenate and arsenite. Liming increased sorption of arsenite greatly, and of arsenate slightly. Sorption of arsenate, but not of arsenite, was accompanied by liberation of varying quantities of silicic acid - apparently a process of anionic exchange. There was no indication of any oxidation of arsenite to arsenate, or of the reverse reduction, in soil.

773
Accumulation Lead in Soils and Herbage at Rothamsted Experimental Station

Williams, C.; Pedol. Dep., Rothamsted Exp. Stn., Harpenden/Herts., England

J. Agr. Sci. (JASIAB), 82(1), 189-92; 1974

LEAD; HERBAGE; SOILS; ACCUMULATION;

774
Effect of Superphosphate on the Cadmium Content of Soils and Plants

Williams, C.; David, D.J.; Div. Plant Ind., Csiro, Canberra, Australia

Aust. J. Soil Res.(ASORAB) 1973, 11(1), 43-56; 1973

CADMIUM; SUPERPHOSPHATE; PLANTS; FERTILIZERS

775
The Use of Soil Extractants to Estimate Plant Available Molybdenum and Selenium in Potentially Toxic Soils

Williams, C.; Thornton, I.

Plant Soil, 39(1), 1973, 149-159

EDTA; AMMONIUM ACETATE; PH; ORGANIC MATTER; SOILS; MOLYBDENUM; SELENIUM; AVAILABILITY

776
A Preliminary Study of the Effects of High Levels of Inorganic Lead on Soil Fauna

Williamson, P.; Evans, P.R.; Dep. Biol. Sci., Portsmouth Polytech., Park Road, Portsmouth, Hamps., England

Pedobiologia, 13(1), 16-21

SOIL FAUNA; SPOIL HEAPS; MINES; ROADSIDE; LEAD NITRATE; LEAD CHLORIDE POWDER; DISTRIBUTION; LEAD; SOILS; FAUNA

The soil fauna of spoil heaps near disused lead mines, of roadside verges, and of plots treated with lead nitrate solutions and lead chloride powder were studied quantitatively. No (toxic) effects of inorganic lead on the distribution and abundance of different groups could be demonstrated.

777
Removal of Plutonium 239, Tungsten 185 and Lead 210 from Soils

Wilson, D.O.; Cline, J.F.; Battelle-Northwest, Richland, Washington

Nature, 209, 941-942; 1966, February

PLUTONIUM 239; TUNGSTEN 185; LEAD 210; SOILS; ADSORPTION; PLANT UPTAKE

The plant-soil interrelationship of Pb 210, W 135, and Pu 239 was investigated. The amounts of these radioisotopes removed from different soils by plants and the effectiveness of several extracting solutions in removing Pu 239 and W 185 from contaminated soils were determined. The uptake of the radioisotopes by barley was soil dependent. The activity in the extraction experiments for the various soils tested was 0.1 uC/g dry soil. Barley grown in the different soils accumulated only very small amounts of Pb 210 and less Pu 239, but W 185 was accumulated in biologically significant amounts. The extracting solutions removed more Pb 210 and Pu 239 from the soil than did the barley.

778
Mercury Distribution in Estuarine-Nearshore Environment

Windom, H.L.; Skidaway Inst. of Oceanography, Savannah, GA

Monitoring Agency Report No. IDOE-73-37; Grants NSF-GX-27946, NOAA-1-36009; 10p. J. of the Waterways, Harbors and Coastal Engineering, ASCE, V99 WW2 Proc. Paper 9753 (257-264); 1973, May

ABSORPTION; SEDIMENTATION; SALT MARSHES; GRASSES; ESTUARIES; MERCURY; WATER; OCEAN; SEDIMENTATION; UPTAKE; PLANTS

The transfer of mercury through an esturarine system of the southeastern Atlantic coast to the open ocean is controlled by: (1) mixing of estuarine waters with off-shore waters; (2) loss in plant detritus due to rafting offshore; (3) migration of estuarine organisms to offshore areas. An additional loss of mercury from the estuarine system is due to sedimentation. A budget of mercury for estuaries along the Georgia coast indicates that the dominant salt marsh plant, SPARTINA ALTERNIFLORA, exerts a strong control on the migration of this metal. Mercury enters the estuary primarily in solution, delivering approximately 1.5 mg annually to each square meter of salt marsh. The annual uptake of mercury by the plant is approximately 0.7 mg/m of salt marsh.

779
The Chemistry and Toxicity of Arsenic in Soil

Woolson, E.A.

Thesis, University of Maryland, College Park, MD, University Microfilms, Ann Arbor, Mich., Order No.: 70-11 650; 1970

ARSENIC; SOILS; IRON; ALUMINUM; ARSENATE; PHOSPHATES; PH; LOAM; SANDY LOAM; SILT; LEACHING; SAND; CALCIUM; BIOASSAY

As-contaminated soils were characterized for their extractable Fe, Al and Ca contents, and the water-soluble Fe, Al and Ca arsenates. They were bio-assayed by the growth of maize which indicated the As-toxicity level. Plant growth reduction and extractable As (0.5 N $NaHCO_3$ for soil pH greater than or equal to 6.5; 0.05 N HCl and 0.025 N H_2SO_4 for pH less than 6.5) were linearly correlated (r equals 0.75). P added to a Lakeland sandy loam increased the toxicity 3.4 fold while it decreased the toxicity 2.6 fold in a Hagerstown silty clay loam. This was attributed to differences in the extractable Fe content of the soils (7 times more in the Hagerstown soil). Leaching a Dunkirk fine sand containing 625 ppm As with 350 inches of 0.05 M K-phosphate solution removed 77% of the total As. Before leaching, 58% of the As was present in the soil as Fe-arsenate, 39% as Al- and 3% as Ca-arsenate. After leaching, 72% of the As left was as Fe-arsenate, 19% as Al-arsenate, 5% as water soluble and 4% as Ca-arsenate.

780

The Chemistry and Phytotoxicity of Arsenic in Soils: 1. Contaminated Field Soils

Woolson, E.A.; Axley, J.H.; Kearney, P.C.; Dept. of Agronomy, University of Maryland, College Park, MD 20742; Plant Science Research Division, Agricultural Research Services, U.S. Dept. of Agriculture, Beltsville, MD 20705

Soil Sci. Soc. Amer. Proc., 35, 938-43; 1971

ARSENIC; IRON; ALUMINUM; CALCIUM; TOLERANCE; ARSENIC FIXATION; ARSENIC ACCUMULATION; RESIDUES; PERSISTENCE; INSECTICIDES; HERBICIDES; PHYTOTOXICITY; PHOSPHORUS; HUMUS; SYMPTOMOLOGY

Arsenic (As) residues on 58 surface soil samples taken from soils with a history of As application average 165 parts per million As, while nearby soils not treated averaged 13 parts per million As. Most of the residual As was found as iron-arsenic (0.1N NaOH extractable) by a modified soil P procedure. Water-soluble As (1N NH4Cl extractable) was detected in soils from two states. Other forms, aluminum- and calcium-arsenic (0.5N NH4F and 0.5N H2SO4 extractable arsenic, respectively), may predominate if the amount of "reactive" aluminum or calcium is high and reactive iron is low. Bioassay of the contaminated and uncontaminated soils showed a correlation of 0.74 between growth reduction and total As and 0.82 with a summation of As fractions. Plants were tolerant to large arsenic applications (670 parts per million arsenic) to soils which were high in reactive (1N NaOH extractable) aluminum.

781

The Chemistry and Phytotoxicity of Arsenic in Soils: 2. Effects of Time and Phosphorus

Woolson, E.A.; Axley, J.H.; Kearney, P.C.

Soil. Sci. Soc. Amer. Proc., 37(2), 254-259; 1973

ARSENATE; SODIUM ARSENATE; SOILS; ARSENIC; CLAY LOAM; LAKELAND LOAMY SAND; CORN; PHYTOTOXICITY; LAKELAND SOIL; LEACHING; IRON; ALUMINUM; CALCIUM; SILTY CLAY LOAM; LOAM; SILT; SAND; PHOSPHORUS; PLANTS

Arsenate from sodium arsenate changes to less soluble compounds in soils with time. To study these changes, the arsenic soluble in 1 N NH4Cl, 0.5N NH4F, 0.1N NAOH, and 0.5N H2SO4 solutions was determined. These dissolved arsenates were designated as WS-AS (Water Soluble), AL-AS, FE-AS, or CA-AS, respectively. The percent of WS-AS present was proportional to AS added and inversely proportional to time, and to the Fe and Al content. Fe-As was the predominant form of As in Hagerstown silty clay loam while AL-AS predominated in Lakeland loamy sand. Growth of corn (Zea Mays) increased with increase in time of as incubation in the soil before planting. Arsenic phytotoxity and AS in the plant were altered by P additions. Arsenic residues in the Lakeland soil became more phytotoxic, while residues in the Hagerstown soil became less phytotoxic with P additions. This plant response was related to the availability of As and P in these soils. Leaching with 0.05M KH2PO4 removed 77% of the total as from a contaminated Dunkirk fine sand. The distribution of the forms of As in this soil changed during leaching. (26 references)

782

Persistence and Reactions of Carbon 14-Cacodylic Acid in Soils

Woolson, E.A.; Kearney, P.C.; Agricultural Environment Quality Institue, Agricultural Research Center, Agricultural Research Service, US Department of Agriculture, Beltsville, MD 20705

Environmental Science and Technology, 7 (1), 47-50; 1973, January

ARSENIC; CACODYLIC ACID; SOILS; PERSISTENCE; CARBON 14; CARBON; CONCENTRATION; AVAILABILITY; ARSINE; ALKYL ARSINE; AEROBIC; ANAEROBIC; DEGRADATION; BIODEGRADABILITY

Carbon-14-labeled cacodylic acid (hydroxydimethylarsine oxide) was prepared by reacting 14carbon-methyl iodide with methyl dichloroarsine. Concentrations of 1, 10, and 100 parts per million of cacodylic acid were established in three soils of varying iron and aluminum content. At 2, 4, 8, 16, 24, and 32 weeks, soils were analyzed for 14Carbon and total arsenic in the water-soluble (ws), calcium (Ca), iron (Fe), and aluminum (Al) fractions. Initially, cacodylic acid was distributed in the following fractions: ws>> Al >Fe>Ca. After 32 weeks, the distribution was ws>Al>Fe>Ca. In contrast, inorganic arsenate (5+) was largely present in the Fe and Al fractions. Cacodylic acid persistence was a function of soil type and after 32 weeks the following amounts of 14carbon were recovered in each soil type by combustion: Christiana (23%), Hagerstown (53%), Lakeland (62%). A decrease in both total 14carbon and total arsenic occurred in all soils with time. A pungent garlic odor was detected in soils receiving 100 parts per million, suggesting the production of a volatile alkyl arsine. The loss of arsenic suggests that one route of cacodylic acid loss from aerobic and anerobic soils is by alkyl arsine volatility. Degradation under aerobic conditions also occurred by cleavage of the carbon--As bond, presumably yielding CO2 and AsO4(3-). This degradation is presumably due to microbiological action.

783

Arsenic Pollutants in the Ecosystem (Les Polluants Arsenique Dans le Systeme Ecologique)

Wullstein, L.H.; Snyder, K.; University of Utah, Salt Lake City, Utah

Soil Sci. 116(5), 376-382; 1973

ARSENIC; PALMAR KERATOSES; NASAL MEMBRANES; SELENIUM; BEER; TOLERANCE; RATS; BIOLOGICAL TRANSFORMATION; SOIL NITROGEN; AMMONIFICATION; NITRIFICATION; SMELTERS; EMISSIONS; PH; NITROSOFICATION; SOILS; NITROGEN; ANIMALS; NOSE; KERATOSES

Relatively high concentrations of arsenic and total nitrogen and relatively low pH values on soils near a smelter are thought to result from the uptake of smelter emissions. Nitrification rates on such soils were reduced compared to control soils and arsenic added to the controls reduced their nitrification rates.
Nitrosofication of soils near the smelter were lower than the controls but the addition of arsenic to the controls did not change the rate of nitrosofication. Ammonification rates of both soils amended with both peptone and arsenic were similar. There was an indication that added arsenic inhibited ammonium oxidation.

784
Model Surveillance for Cadmium Pollution

Yamagata, N.; Iwashima, K.; Kuzuhara, Y.; Yamagata, T.; National Institute Health, Tokyo, Japan

Koshu Eiseiin Kenkyu Hokoku (KEKHA7), 20(3), 170-186; 1972

CADMIUM; RIVERS; WATER; PADDIES; SOILS; MODEL

785
Studies on Environmental Contamination by Uranium. 3. Effects of Carbonate Ion on Uranium Adsorption to and Desorption from Soils

Yamamoto, T.; Yunoki, E.; Yamakawa, M.; Shimizu, M.; Hyg. Lab. Okayama Pref., Okayama

J. Radiat. Res., 14(3), 219-224; 1973

URANIUM; CARBONATES ION; ADSORPTION; DESORPTION; SOILS; ALLUVIAL SOIL; SAND; VOLCANIC ASH; URANYL; CARBONATE; STREAM WATER

Adsorption of uranium on soils and its desorption from uranium adsorbed soils in the presence of carbonate ion were examined by using three kinds of soils; alluvial soil, sandy soil and volcanic ash soil. The adsorption ratio of uranium for each soil was approximately 100 per cent for the mixtures of uranyl (1-50 microgramU/ml) and solutions (4.3 - 109 microgram CO3 ml). In the uranium adsorbed soil (7.1 - 500 microgram U/g air dried soil) with carbonate ion (4.3, 43.4 microgram/ml), the desorption ratio of uranium for each soil was low (0.09 - 1.2%). The adsorption of uranium on soils and the desorption from uranium adsorbed soils with stream water were probably similar to those with carbonate solution.

786
Effects of Environmental Conditions and the Coadministration of Growth Retardants on the Response of Sugarcane-M to Foliar Treatment with Gibberellin

Yates, R.A.

Agron. J., 64(1), 1972, 31-35

SOILS; MOISTURE; DALAPON; AZA; URACIL; SUCROSE; WATER

787
Combined Ion-Exchange Separation and Atomic Absorption Determination of Heavy Metals in Soils. I. Heavy Metal Contamination of Soils

Yoneda, S.; Imamura, M.; Shigemoto, H.; Kochi, T.; Univ. Okayama, Okayama, Japan

Nippon Dojo-Hiryogaku Zasshi (NIDHAX) 43 (8), 278-84; 1972

TRACE ELEMENTS; DETERMINATION; SOILS; ION EXCHANGE; ATOMIC ABSORPTION; HEAVY METALS

788
Diagnosis of Environment Seen from Soil-Pollution. The Present State of Soil Pollution by Heavy Metals and Pesticides

Yoskiike, A.; Section of Soil and Pesticides for Agriculture, the Environment Agency of the Japanese Government, Tokyo, Japan

Kankyo Sozo (Environ. Creation), 4(1), 84-89; 1974

ORGANOCHLORINES; SOILS; AGRICULTURE; METALS; TRACE ELEMENTS; BENZENE HEXACHLORIDE; CROPS; PESTICIDES; POTATOES; CUCUMBERS; ALDRIN; DIELDRIN; ENDRIN; REGULATIONS; BHC; DDT

The present state of soil pollution in Japan is outlined. Soil pollution by pesticides used for agricultural uses is attributed to persistent, not-easily decomposed organochlorine insecticides. These pollute the field soil, are absorbed by the crops and in turn pollute the agricultural produce. Instances of crop-pollution through polluted soil are potatoes and cucumbers produced in eight prefectures and containing aldrin, dieldrin, and/or endrin more than the standard value in 1970. Countermeasures for soil pollution by pesticides include the regulation of pesticides with severe restrictions on the use of aldrin and dieldrin and prohibition of the use of BHC and DDT. Pesticides applying for registration will be held back if they are persistent and pollute the soil. Fields polluted by persistent pesticides are not recommended for planting of vegetable crops such as cucumber and Japanese radish, but can be used for growing ornamental plants.

789
Separation of Lead-203

Yushkan, E.I.; Iokhle'Son, S.B.; Rovinskii, F.Y.; Sergeeva, E.I.; USSR

Radiokhim. Anal. Ob'Ektov Vnesh. Sredy(26UHAP) 1972, () 91-3; 1972

LEAD 203; DETERMINATION; PLANTS; SOILS; ASH

790
Changes of Copper Contents in Muck Soil as a Result of Copper, Sodium EDTA and Nitrogen-Phosphorus-Potassium Fertilization on its Properties Background

Zablicki, Z.; Inst. Glebozn. Melior, Akad. Roln., Szczecin, Poland

Zesz. Nauk., Akad. Roln. Szczecinie(ZARSA8) 1972, 9(38), 517-36; 1972

FERTILIZERS; COPPER; SOILS; MUCK; EDTA

791
Dynamics of Trace Elements in Liman Meadow Soils of the Arid Zone of Central Kazakhstan

Zhukova, V.A.; Solodnikova, E.A.

Izv. Akad. Nauk. Kaz. SSR. Ser. Biol. Nauk. (1), 1972, 6-11

COPPER; ZINC; MANGANESE; COBALT; MOLYBDENUM; BORON; IRRIGATION; TRACE ELEMENTS; SOILS

792
Lead in Soils and Plants

Zimdahl, R.L.; Colorado State University, Fort Collins, CO 80521

Part of Edwards, H.W. (Ed.), Impact on Man of Environmental Contamination Caused by Lead, Interim Report, July 1, 1971-June 30, 1972 (p. 98-123) 241; 1972

LEAD; SOILS; PLANTS; LANGMUIR; EQUATION; SORPTION; CATION EXCHANGE; HIGHWAY PROXIMITY; AUTOMOBILE EMISSIONS; PH; UPTAKE; BEANS; CORN; WHEAT; FOLIAR ADSORPTION; AVAILABILITY; PERSISTENCE

Our work to data has shown that a major portion of the lead emitted by automobiles traveling on an interstate highway is deposited within 50 feet of the highway. The lead does move downward in the soil profile but at a very slow rate. Values up to 1,000 ppm have been found adjacent to I-25 north of Denver. The background lead level for soils in the same area is approximately 22 ppm. Soil sorption studies have shown that equilibrium occurs within 48 hours. Studies of seven different soils with varying characteristics have shown that the Langmuir sorption equation best describes the process. That is, each soil shows a maximum value for the sorption of lead. Our data indicate that the capacity of the soil for sorbing or immobilizing lead is correlated with the cation exchange capacity of the soil. This effect is attenuated by pH which decreases the capacity of the soil to sorb lead and in theory should make the lead more available to plants. Studies with plants grown in hydroponic culture and then exposed to lead nitrate solutions have shown that several different plants have a great capacity to take up lead from solution. Soil studies have shown a relationship between soil lead levels and the amount of lead taken up by the plant. The literature contains many papers which attribute lead in the plant to foliar uptake. We have developed an apparatus to specifically expose plants to foliar lead. Additional studies involving detached cuticle have shown very little transport of lead across the foliar cuticular barrier.

793
Lead in Soils and Plants: A Literature Review

Zimdahl, R.L.; Arvik, J.H.; Weed Res. Lab., Dept. Bot. Plant Pathol., Colorado State Univ., Fort Collins, CO

CRC Critical Rev. Environm. Contr. 3(2), 213-220; 1973

LEAD; SOILS; PLANTS; ATMOSPHERIC FALLOUT; MOVEMENT; ROOTS; FOLIAGE; TRANSLOCATION; CROPS; REVIEW; AIR; SORPTION; UPTAKE; TOPICAL COATING

This paper reviews most of the literature pertinent to the behavior of lead in soils and plants. The natural lead content of the world's soils averages 16 ppm, and the addition of lead from atmospheric fallout increases this level only imperceptibly. Lead movement in the soil is limited due to the sorptive ability of the soil. Lead is taken up slowly by plant roots and may be absorbed by foliage. Lead taken up from soil generally remains in the root with little translocation to the shoot. When plants are exposed to atmospheric contamination, most of the lead remains as a topical coating of particles on the foliage. Present lead levels associated with crops are not generally sufficient to pose a hazard to human or animal health.

794
Soil Fixation of Lead

Zimdahl, R.L.; Skogerboe, R.K.; Arvik, J.H.; Colorado State Univ., Dept. of Botany and Plant Pathology, Fort Collins; Colorado State Univ., Dept. of Chemistry, Fort Collins

American Society of Agronomy, 63rd Annual Meeting, New York, N.Y., August 15-20, 1971, Abstracts, 149-50; 1971

HIGHWAYS; SOILS; AUTOMOBILE EMISSIONS; LEAD; CONCENTRATION; TRAFFIC; WIND; LEACHING EXPERIMENTS; ADSORPTION; LANGMUIR EQUATION

The lead level in soil surrounding an interstate highway was investigated. The soil concentration of lead was associated with traffic volume, distance from the highway, depth in the profile, and prevailing wind direction. Leaching experiments have confirmed limited downward movement of lead in four soil types. Lead is immobilized rapidly by soil with adsorption being complete in 48 hr. The Langmuir adsorption isotherm best describes the process.

795
Determination of Maximum Complexing Ability of Water Soluble Complexants

Zunino, H.; Peirano, P.; Aguilera, M.; Escobar, I.

Soil Sci., 114, 414-416; 1972

WATER; DETERMINATION; COMPLEXANTS; WATER SOLUBLE COMPLEXANTS

796
Use of the Resin-Exchange Method for the Determination of Stability Constants of Metal-Soil Organic Matter Complexes

Zuniono, H.; Galindo, G.; Peirano, P.; Aguilera, M.

Soil Sci., 114(3), 229-233; 1972

SOILS; RESIN-EXCHANGE; DETERMINATION; ORGANIC MATTER

797
Significance of the Soil in Environmental Quality Improvement. A Review

Zwerman, P.J.; DeHaan, F.A.; New York Coll. Agric. Life Sci., Cornell Univ., Ithaca, NY

Sci. Total Environ. (SIEVA8), 2(2), 121-155; 1973

798

798
Copper in some Soils of Tadzhikistan

Zyryanova, A.N.; USSR

Tr. Tadzh. Nauch.-Issled. Inst.
Pochvoved. (TPATAX) 1972, 15(1), 196-202; 1972

COPPER; TADZHIKISTAN SOILS; SOILS

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